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A PROGRAM FOR NATURAL HISTORY RESEARCH FOR THE 1970's

A Detailed Listing of Projects as Presented on Pages A-19 through A-24 of the
Smithsonian Institution
Fiscal Year 1972 Justification of Estimates of Appropriations
to the Office of Management and Budget

SMITHSONIAN INSTITUTION
National Museum of Natural History
Washington, D.C.

Recap of New Programs--Fiscal Year 1972

	<u>Positions</u>	<u>Amount</u>	<u>Page</u>
<u>I. Research</u>			
a. Environmental Studies (interactions of organisms with their environment)	55.0	892.6	1
b. Evolutionary Studies (evaluation of organisms and their social organizations)	38.0	585.3	54
c. Geological Studies (Earth, moon and other extra-terrestrial bodies)	12.0	344.5	100
d. Anthropological Studies (origin and evolution of man and his cultures)	<u>6.0</u>	<u>235.6</u>	110
Total, Research	111.0	2,058.0	
<u>II. Reference Systems Management</u>			
(Curation, restoration, preservation and protection of the National Collections)	46.0	551.2	120
<u>III. General Public Enlightenment and Education</u>			
(Exhibits, tours, and educational activities at primary and secondary school levels)	<u>3.0</u>	<u>21.9</u>	167
GRAND TOTAL	160.0	2,631.1	

Ia Environmental Studies

<u>Item</u>	<u>Positions</u>	<u>Amount</u>	<u>Page No.</u>
(1) Development of National Reference Source for Pottery of Ancient Palestine Using EDR Techniques	4.0	42.8	1
(2) PaleoIndian, Paleoclimatology and Paleo-Fauna Research Program	1.0	53.0	2
(3) Fundamental Research Program in Biology and Environment in Human Progress	4.0	65.7	4
(4) Fundamental Research Program on the Study of Fossil and Plant Pollens	1.0	71.4	7
(5) Investigation of the Biological Inter-relationships of Plant Feeding Insects	1.0	8.0	10
(6) Expanded Studies of Pollinating Insects and their Relationships to Increasing Crop Yields	1.0	21.1	12
(7) Studies on the Increasing Use of Biological Control Agents in Lieu of Pesticides	2.0	27.7	14
(8) Study of the Role of Soil Arthropods in the Food Chain and as Indispensable Agents of Conversion of Organic Debris	3.0	45.4	16
(9) Studies of Aquatic Insects and their Role in the Food Chain and as Pollution Indicators	2.0	34.3	18
(10) Coral Reef Biology	4.0	57.0	20
(11) Biology of Shallow Water and Estuarine Marine Invertebrates	2.0	20.7	21

(12)	Invertebrates from the International Indian Ocean Expeditions	4.0	51.0	22
(13)	Research on Panamanian Marine Invertebrates	3.0	19.0	24
(14)	Studies on Freshwater Environments in the United States	1.0	15.7	25
(15)	Increase in Research Capability to Meet Special Needs	1.0	15.7	26
(16)	Ecological and Systematic Study of Coralline Algae	5.0	105.5	27
(17)	Study of the Substrate of Coral Reefs	2.0	33.3	29
(18)	The Evolution of Marine Ecosystems	7.0	80.9	31
(19)	Biology, Evolution, and Ecology of the Bony Fish	1.0	15.5	33
(20)	The Abyssal Ostracode Program	1.0	15.4	35
(21)	Systematic and Ecological Studies of Marine Birds	-	2.3	37
(22)	Development of National Marine Mammal Study Center	1.0	17.6	39
(23)	Endangered Freshwater Fishes of South America: Systematic, Ecological and Biogeographic Research	2.0	31.7	42
(24)	Comparative Faunistic Inventory of Indo-Pacific Coral Reef Fishes	-	2.7	45
(25)	Systematic and Ecological Research on Tropical Birds	2.0	29.0	47

(26) Systematic Research on Freshwater Amphibians and Reptiles	--	2.5	51
(27) Systematic Research on Sharks and Rays Total--Environmental Studies	-- 55.0	<u>7.7</u> 892.6	52

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u> <u>Man-Years Amount</u>	<u>Base Resources to be reallocated</u> <u>Man-Years Amount</u>	<u>Additional Resources Requested for 1972</u> <u>Positions</u> <u>Amount</u>
			4 \$42,800

Development of National Reference Source for Pottery of ancient Palestine using Electronic Data Processing Techniques. The creation of an inventory of ancient Palestinian pottery in the collections of the Smithsonian and other museums is proposed. Electronic data processing techniques will be used to capture, store and query the inventory data. The ability to access rapidly and comprehensively the data assimilated greatly increases the scientific value of the project. New discoveries on ancient ceramic technology, on trade and migration routes, and on cultural and community attainments can confidently be expected.

Once created and stored on punched cards or magnetic tape the inventory can easily be sent to experts at other museums and universities. This will be of substantial benefit to scholars and students for no books are currently available on Palestinian ceramics, and the data as it exists in museums is widely dispersed and difficult to get at.

It is estimated this project would require five years to complete with an annual expenditure of about \$40,000 and a total of \$200,000. Four new positions, consisting of 1 archeologist (GS-12), 2 museum technicians (1 GS-7 and 1 GS-5), and 1 clerk-typist (GS-4), will be required. Computer time required will be \$3,000.

Budget:

Personnel	\$37,300
Travel	2,000
Other services	3,000
Supplies	500
Total	\$42,800

Program Category **I a**

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description/ Priority No.

1.0 \$25,000 1 • \$53,000

PaleoIndian, Paleoclimatology and Paleo-Fauna Research Program. Study of early man in Northern and Southern Hemispheres of the New World is necessary to reconstruct past climates, past flora and fauna and the different PaleoIndian adaptations. In late Pleistocene times man was hunting animals now extinct for his basic food supply. Archeologists and vertebrate paleontologists working together in exploring sites occupied by ancient man and in excavating the fossils and the artifacts add important new knowledge both to the history of man and the past flora and fauna. This interdisciplinary approach is essential and would produce significant information on the evolution and survival of Pleistocene animals and how the Paleo-Indian used them as a basic food supply. Expansion of highways, development of lands, flood and irrigation control projects, resorts, and the annual erosion of beds along streams often destroy this data and specimens and they must be salvaged before they are lost to science. Many of these archeological and paleontological sites are in deserts of the American Southwest, South America and Mexico which in the past were much wetter regions. These coordinated researches would lead to reconstruction of past climates, and data useful to the understanding of long-range climatic cycles.

Program Category I a

This project would be of three years' duration since the field work will be done only in the dry and cooler season of each year, and would be supported largely by re-direction of funds and personnel now engaged on other projects.

One new position (archeologist, GS-13) would be required. Supplies, such as gas, oil, lubrications, medical materials for team, etc., would cost \$2,600 annually. Transportation of specimens to the US would require an expenditure of \$2,000. The first year would entail \$8,000 for non-recurring field expenses as follows: 4-wheel drive vehicle and spare parts, \$6,000; camping equipment, \$1,500; and excavating equipment, \$500.

Budget (first year):

Personnel	\$18,000
Travel	14,400
Transportation of things	2,000
Other services	8,000
Supplies	2,600
Equipment	8,000
Total	<u>\$53,000</u>

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> <u>Amount</u>
		4 \$65,700

Project Description

Fundamental Research Program in Biology and Environment in Human Progress. This is a program of basic research designed to study man's evolutionary adaptation to civilization and cities. The studies will be concentrated in two principal areas A. Bone Biology and B. Relationship of Ancient Land Use to Man's Physical and Social Development. Specific projects which would be initiated are:

A. Bone Biology

1. Bone as a biographer. This would include the development of finer and more penetrating techniques than now exist for identification of an individual and his or her life history from a skeleton, with, for example, more precise data on parity (number of births) and on malnutrition.
2. History of diseases from study of ancient and modern skeletons, for example falciparum malaria as related to anemia, syphilis, various forms of arthritis, bone absorption of pollutants (e.g. lead).
3. Create a registry of paleopathologic information and specimens for the Old World and New World human skeletal collections of the National Museum of Natural History. This register, which would contain both detailed microscopic and more general macroscopic data on the evidence and effects of disease in bone, would be created as a natural byproduct to the research proposed and will be valuable as a reference document long after the research is complete.
4. Relation of contemporary with prehistoric dental disease.
5. The microchemistry and physiology of bone in aging, in malnutrition, and in disease.

Program Category I a

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<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description

6. Bone protein changes in the ground: dating of ancient skeletons.

B. Relationship of Ancient Land Use to Man's

Physical and Social Development

1. Nutrition, growth, health, and culture advance from the end of the Paleolithic period until now. Data on about 2,500 skeletons from 10,000 B.C. to the present in the Eastern Mediterranean area would be combined with archeological data on diet and level of culture and early historical data on disease to give a picture of the effect of the environment, as modified by man, on historical achievement. The same thing is possible for North America based on material already in the national collections.
2. The study of man's evolutionary adaptation to civilization and cities to find out how far the new environments which man is creating for himself are changing and will change the basic genetic makeups of our various populations.
3. Differential aging, pedomorphism, and the evolution of longevity.

Participating in this project and providing support for their own efforts would be the Office of the Medical Examiner (Baltimore) the Armed Forces Institute of Pathology and Medical Schools, primarily, in the vicinities of Washington and Baltimore.

Four new positions would be required for this project: a physical anthropologist, GS-12; 2 museum technicians, GS-7; and 1 museum technician, GS-5. Necessary equipment would consist of a special photographic X-ray microscope. Computer time would require about \$5,000. The cost for the first year is estimated at about

<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

\$65,700 with a somewhat lower figure (\$50,000) in subsequent years since the major expense for equipment and foreign travel would occur in fiscal year 1972.

Budget:

Personnel	\$39,000
Travel	7,000
Other services	5,000
Equipment	<u>14,000</u>
Total	\$65,700

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Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount
\$20,000

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description/Priority No.

Fundamental Research Program on the Study of Fossil and Recent Pollens. Palynology is one of the most important areas of interdisciplinary research on the evolutionary history of flowering plants. This work is needed to complement current research and provide basic data in tracing the evolutionary history of modern plants through the identification and analysis of fossil spores and pollens. The kinds of pollen found at the various strata would also provide the paleobotanists with information on the geographic distribution, relative abundance and changing nature of the plant life and, hence, the variations in climatic environment and ecological patterns. Such information would be of incalculable value not only to those interested in paleobiology, botany and evolutionary biology but to the archeologists and ethnologists as well. Examples of the applications to current problems in these fields are: 1) Studies of development of economically useful plants, particularly of cultivated species. It is important to our understanding of Pre-Columbian culture to know, for example, when Maize pollen first appears in the strata in sufficient quantity to indicate domestication. Even in areas so humid that actual preservation of prehistoric corncocks in archeological sites is not possible, critical examination of the pollen

Program Category
Ia - \$10,000
Id - \$10,000

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description/Priority No.

sequences has shed light on periods of expansion (or contraction) of agriculture. Often agricultural development is accompanied by evidence of plants which colonized cleared fields which are lying fallow. Studies of this type would add a great deal to our understanding of (a) domestication of plants and (b) changes in the vegetational cover which accompanied long-term land clearance. 2) In highland Peru domestication of plants and animals began thousands of years ago, preceding the high development of cultures. Some theories have related the high civilization development in the New World to corn alone. There is doubt that this is correct. The resolution of this question will have considerable bearing on our studies of the development of civilization in the New World. Only by pollen studies in those climates where all remains except pollen have been destroyed can this be proven. Also information would also be important in reconstructing the previous climate of the area and its botanical history. 3) Savannas (or grasslands) in the New World have often been attributed to man. In many cases it appears they are of greater age. Where the original forest cover is gone only the fossil pollen record can provide the clue to this information which is essential to correct interpretations of the subsistence means of Pre-European man in parts of the Western Hemisphere.

This would be a long term program funded at a cost of \$32,900 annually. However, this is an interdisciplinary project of which the cost to the Department of Anthropology would be \$20,000 annually for a contractual consultant, \$10,000 of which would be required for Program Category Ia and \$10,000 of which would be required for Program Category Id.

Budget	
Other services	\$20,000
Total	\$20,000

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description/Priority No.

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This would be a long term program funded at a level of \$32,900 annually. Two new positions (a botanist, GS-13, and a museum technician, GS-7) would be required. Construction of laboratory facilities and modification of existing rooms would require \$15,000; initial equipping of the laboratory would be \$75,000. All costs would be borne by the two program categories involved on a 50-50 basis, i.e., cost to Program Category Ia would be \$61,400 and to Program Category Id \$61,500.

Budget:

Personnel	\$ 26,700
Travel	2,000
Other services	15,000
Supplies	1,200
Equipment	<u>78,000</u>
Total	\$122,900

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u>
Investigation of the biological inter-relationships of plant feeding insects.	0.6	\$8,500	1
		\$11,200	
			\$22,900

Investigation of the biological inter-relationships of plant feeding insects.

Studies of plant feeding insects have in recent years provided much basic biological knowledge of such natural phenomena as host specificity, host transferability, isolating mechanisms and polymorphism. In addition, considerable information regarding the systematic relationship of the host plants can be acquired through a careful study of their associated insect pests. Numerous species of herbivorous insects are serious pests of agricultural crops and ornamental plants. In the United States alone, destruction caused by these pests amounts to more than two billion dollars each year. Without the various means of chemical control now utilized, the estimated losses would soar considerably higher. As chemical control for these pests is reduced to lessen environmental pollution, biological control programs must be discovered or improved. Consequently, there exists an urgent need by scientists seeking to develop these controls, for basic biological knowledge of all important insect pests.

Program Category I a - \$8,000

Ib	-	\$7,600
II	-	\$7,300

This project would require one new position, a research assistant, GS-7. Costs for equipment would be broken down as follows: binocular microscope, \$1,500; library and office equipment, \$1,000; camera equipment, \$1,500; insect cases and drawers, \$4,200; miscellaneous equipment, \$1,500. *

Budget:

Personnel	\$ 8,700
Travel	3,000
Supplies	1,500
Equipment	<u>9,700</u>
Total	\$22,900

*Of the total budget, Program Category Ia will account for approximately 35% or \$8,000; Program Category Ib for 33% or \$7,600; and Program Category II for 32% or \$7,300.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
Expanded Studies of Pollinating Insects and their Relationship to Increasing Crop Yields.	0.4	\$5,600	0.6	\$6,100	2	\$38,400

Expanded Studies of Pollinating Insects and their Relationship to Increasing Crop Yields.

The present limited program on behavior, intra-floral relationships and systematics of pollinating insects has resulted in the discovery of the very important and unique role played by certain solitary North and South American bees in the pollination of the squashes and gourds native to the Americas. As a result of the current studies, plans are being made now for the importation and liberation of certain of the American bees into Hawaii and developing countries where the American squashes and gourds are already being cultivated. It is anticipated that this will result in substantially increased crop yields in Hawaii and other countries where bees native to those areas are not effective pollinators. The expansion of studies on pollinating insects is required to provide additional basic data to scientists involved in studies designed to meet the very urgent need for improvement of crop yield due to the ever-burgeoning world population.

<u>Program Category</u>	<u>I a</u>	<u>I b</u>	<u>II</u>
	\$21,100	\$11,900	\$5,400

The major requirements for carrying out studies under this project are additional personnel (one entomologist (specialist in Diptera), GS-12, and one research assistant, GS-7) and \$11,200 worth of equipment (binocular microscopes, \$2,500; library, office, and laboratory furniture, \$1,500; camera equipment, \$2,500; insect cases and drawers, \$4,200; and miscellaneous equipment, \$500). Of the total fiscal year 1972 budget, Program Category Ia will account for approximately 55% or \$21,000; Program Category Ib for 31% or \$11,900; and Program Category II for 14% or \$5,400. The annual cost of this proposed expansion in subsequent fiscal years would be \$25,500.

Budget for FY 1972:

Personnel	\$24,000
Travel	2,600
Supplies	600
Equipment	<u>11,200</u>
Total	\$38,400

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
0.3	\$5,300	0.6	\$16,100	3	\$46,200	

Studies on the increasing use of biological control agents in lieu of pesticides.

Results achieved so far in this important but minuscule program have demonstrated the substantial possibility of predaceous solitary wasps serving as important agents in the control of insects of economic importance. These wasps prey upon caterpillars, aphids, spiders and other arthropods in tremendous numbers as food for their young. Just one female wasp will use as many as 600 spiders or 250 caterpillars in the brood cells which she will provision. Many of the species preyed upon are important as pests of vegetation, acting as defoliators, leaf miners or sapsuckers, so that the wasps serve as effective biological control agents. Our present urgent concern to lessen environmental pollution now being caused by insecticides and other chemical control methods by substitution of biological agents makes it essential that the expansion of present studies on predaceous and parasitic insects be given increased emphasis immediately. Studies would also be initiated on predacious beetles, another insect group of major importance as biological control agents.

Program Category I a - \$27,700
 I b - \$12,900
 II - \$5,600

Additional staffing and equipment resources needed for carrying out this project are: 3 new positions (1 entomologist, GS-12; 1 research assistant, GS-7; and 1 secretary, GS-6) and \$11,200 worth of equipment (microscopes, \$2,500; office, library, and laboratory furniture, \$1,500; camera equipment, \$2,500; insect cases, \$1,000; insect drawers, \$3,200; and miscellaneous equipment, \$500). *

Budget:	
Personnel	\$31,800
Travel	2,600
Supplies	600
Equipment	<u>11,200</u>
Total	\$46,200

*Of the total budget, Program Category Ia will account for approximately 60% or \$27,700; Program Category Ib for 28% or \$12,900; and Program Category II for 12% or \$5,600.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
Man-Years Amount	Man-Years Amount	Positions Amount
0	1.0	6
	\$10,200	\$87,300

Project Description

Study of the role of soil arthropods in the food chain and as indispensable agents of conversion of organic debris.

Arthropods are one of the most abundant constituents of the soil fauna and flora. Rich soils may harbor more than 10 million arthropods per acre. These animals are very important elements in the food chain of higher organisms. Some are indispensable in conversion of organic debris, thus maintaining the productivity of our environment. Others are important as parasites or predators of other soil animals. Many of them are very sensitive to insecticides and herbicides, thus serving as indicators of soil pollution. Despite their abundance, virtually nothing is known concerning the identity or behavior of these arthropods.

Because of our national priorities in increasing productivity and reducing environmental pollution, there is an urgent need to give increased attention to the studies on these very important components of the soil biota. In order to carry out this project, six new positions will be needed, among them 2 entomologists, GS-12, supported by 1 illustrator (GS-7), 1 research assistant (GS-7), 1 secretary (GS-6), and 1 field technician (GS-5). One entomologist will work on the apterygote insects

<u>Program Category</u>	
I a	- \$45,400
I b	- \$34,900
II	- \$7,000

(silverfish, springtails, and allies) and the other on the arachnids (mites, spiders, and ticks). Necessary equipment would be microscopes, \$6,700; insect cases, \$2,000; library, office, and laboratory furniture, \$6,600; Mettler balance, \$700; and miscellaneous equipment, \$600. *

Budget:	
Personnel	\$62,800
Travel	4,200
Supplies	3,700
Equipment	<u>16,600</u>
Total	\$87,300

* Of the total budget, Program Category Ia will account for approximately 52% or \$45,400; Program Category Ib for 40% or \$34,900; and Program Category II for 8% or \$7,000.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970 Man-Years Amount	Base Resources to be reallocated Man-Years Amount	Additional Resources Requested for 1972 Positions Amount
0.7 \$11,100	1.2 \$12,400	4 \$59,200

Project Description

Study of Aquatic Insects and their role in the food chain and as pollution indicators.

The present program on aquatic insects occurring in freshwater environments would be expanded by the initiation of studies on aquatic Diptera. Larvae of insects belonging to this order occur in tremendous numbers in freshwater habitats. They are extremely sensitive to all kinds of pollution in their larval habitats so that their presence or absence in a given water source is an indication whether pollution has occurred. Also, because of their abundance, both the larvae and adults of these insects are extremely important elements in the food chain in aquatic habitats. The present national priorities on environmental pollution make it imperative that we augment our present program on aquatic insects now in order to provide basic information to other federal agencies and to other organizations in this country and in the developing countries where this kind of expertise is not available.

In order to expand this program, four new positions will be required as follows:

Program Category I a	- \$34,300
I b	- \$17,800
II	- \$7,100

1 entomologist (specialist on aquatic Diptera), GS-12; an illustrator, GS-7; a research assistant, GS-7; and a secretary, GS-6. The illustrator will assist the entire group working on aquatic insects. Equipment requirements will be binocular microscopes, \$3,500; electric typewriter, \$500; office and laboratory furniture and library, \$5,500; insect cases and drawers, \$4,200; and miscellaneous equipment, \$500. *

Budget:	
Personnel	\$40,500
Travel	2,400
Supplies	2,100
Equipment	<u>18,700</u>
Total	\$59,200

* Of the total budget, Program Category Ia will account for approximately 58% or \$34,300; Program Category Ib for 30% or \$17,800; and Program Category II for 12% or \$7,100.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources Requested for 1972 Positions Amount
4 \$57,000

Level of Effort in 1970 Man-Years Amount
Base Resources to be reallocated Man-Years Amount

Project Description

Coral Reef Biology. Coral reefs provide one of the more complex habitats in the tropical marine areas of the world; they are dominant features of the shallow waters of the tropical Pacific Ocean, but also occur to lesser extents in other areas. A specialist on corals is needed to permit an expansion of basic research on the biology of coral reefs, and particularly to provide basic data to researchers studying the productivity and potential value of these areas. The current crown-of-thorns starfish infestation and its economic effect on coral reefs has pointed up the lack of information on the coral habitat. Studies on coral reefs in the Pacific could be directly related to the utilization of these reefs as well as to local economies in the American Trust Territories there. This project will require four new positions: a systematic zoologist, GS-12; an illustrator, GS-7; and two museum technicians, GS-5. Other requirements will be alcoholic stacks at \$10,000, jars at \$2,500, miscellaneous supplies at \$1,000, and miscellaneous equipment at \$3,500.

Program Category I a

Budget:

Personnel	\$38,000
Travel	2,000
Supplies	13,500
Equipment	<u>3,500</u>
Total	\$57,000

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
					4	\$41,400

Biology of Shallow Water and Estuarine Marine Invertebrates. Microscopic invertebrates, primarily worms and small crustaceans, comprise a large portion of the bottom-living animals of shallow marine waters. These smaller worms and crustaceans are important food items for larger animals, particularly bottom-feeding fishes. This project would provide basic information for fishery biologists and others seeking to develop and increase the economic value of products obtainable from the sea. The abundance of smaller invertebrates in sediments and their habitat requirements suggest that these organisms might be important environmental indicators, but baseline information on their biology, numbers, and occurrence is required in order to assess their importance.

This project will require four new positions: two illustrators, GS-7, and two museum technicians, GS-5. Equipment in the form of slide storage units for \$4,000 will be needed. Program Categories Ia and Ib will account for one-half each (\$20,780 a piece) of the total budget.

Personnel	\$31,400
Travel	5,000
Supplies	1,000
Equipment	<u>4,000</u>
Total	\$41,400

Program Category Ia - \$20,700

Ib - \$20,700

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
					5	\$68,000

Collections from the International Indian Ocean Expeditions. As a result of the International Indian Ocean Expeditions, important collections of invertebrates, particularly crustaceans, sipunculid worms, echinoderms, and mollusks, and midwater fishes from the Indian Ocean are available for study by Museum scientists. These collections are particularly important because they are the most comprehensive ever made in that area. The funds requested would provide support for the study and evaluation of these collections and make the results available to the scientific community in general and in particular to fishery biologists working in the Indian Ocean. Rational exploitation of the world's oceans is dependent precisely on the kinds of information which would result from these studies. Although the International Indian Ocean Expedition was officially designated as a National Program, funds for research on the collections made during the expedition were not made available to Bureau Scientists through the National Science Foundation.

This project will require 5 new positions: 1 illustrator, GS-7; 1 librarian, GS-7; 1 museum technician, GS-5; 1 museum aid, GS-4, and 1 clerk-typist, GS-4. Other expenses will be alcoholic stacks for \$10,000; construction for \$7,500; equipment for \$6,000; and jars, tanks, paper trays, and boxes for \$7,500. Program Category Ia will account for approximately 75% or \$51,000 of the total budget; Program Category Ib for approximately 25% or \$17,000.

Program Category
 I a- \$51,000
 I b- \$17,000

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Budget:

Personnel	\$37,000
Other services	7,500
Supplies	7,500
Equipment	<u>16,000</u>
Total	\$68,000

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u> <u>Man-Years Amount</u>	<u>Base Resources to be reallocated</u> <u>Man-Years Amount</u>	<u>Additional Resources Requested for 1972</u> <u>Positions</u>	<u>Additional Resources Requested for 1972</u> <u>Amount</u>
Research on <u>Panamanian Marine Invertebrates</u> . It is essential to expand the research initiated in FY 1971 on the occurrence, relationships, distribution, and abundance of marine invertebrates in the Panamanian region, with emphasis on those groups which might best be utilized as indicators of environmental change upon completion of the proposed canal as well as emphasis on collection of baseline data on all major groups of invertebrates in the Panamanian region.			6	\$38,000

This project will require six new positions: 1 illustrator, GS-7; 2 research assistants, GS-5; and 3 summer aids, GS-3, part-time. Alcoholic storage shelving for \$5,000 and jars for \$2,000 will also be needed. Program Category Ia will require \$19,000 of the \$38,000 budgeted, while Program Category Ib will require the other \$19,000.

Budget:

Personnel	\$26,500
Travel	3,000
Supplies	3,500
Equipment	5,000
Total	<u>\$38,000</u>

Program Category **I a - \$19,000**
 I b - \$19,000

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Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
					2	\$26,200

Studies on Freshwater Environments in the United States. Additional funds are required to expand studies on invertebrates occurring in freshwater environments in the United States, with particular emphasis on the biology and distribution of crayfishes and associated organisms. These studies will provide basic environmental data on the inhabitants of freshwaters; documentation of the kinds of invertebrates and their numbers in all freshwater habitats is needed to provide basic information required by other Federal agencies and research organizations investigating the quality of the environment in this country.

This project will require two new positions: an illustrator, GS-7, and a research assistant, GS-5. Other requirements will be \$5,000 for alcoholic stocks and \$2,500 for jars. Of the \$26,200 budgeted for this project, Program Category Ia will require 60% of it or approximately \$15,700, while Program Category Ib will require 40% of it or approximately \$10,500.

Program Category Ia - \$15,700
Ib - \$10,500

Budget:

Personnel	\$15,700
Travel	2,000
Supplies	3,500
Equipment	5,000
Total	\$26,200

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> Amount
		2
		\$31,500

Project Description

Increase in Research Capability to Meet Special Needs. The objective of this project is to diversify research and curatorial programs of the Department in the biology and ecology of aquatic organisms without making permanent additions to the professional research staff. This would broaden the Museum's capabilities in research, to complement existing research and curatorial programs, and would involve the development of a continuing exchange program at the senior level with both universities and other museums. Establishment of this program, in response to changing needs in research expertise, will enhance the Museum's ability to meet current challenges in investigations of the environment and in other areas where additional professional talent is needed from time to time and at the same time avoid the necessity of adding new, long term members of the scientific staff.

This project will require 2 additional positions: 1 systematic zoologist, GS-13, and 1 museum technician, GS-5. Program Category Ia interest in the project will be approximately \$15,700 and Program Category Ib interest will be approximately \$15,800.

Budget:

Personnel	\$25,000
Travel	1,000
Supplies	2,000
Equipment	3,500
Total	<u>\$31,500</u>

Program Category

I a - \$15,700

I b - \$15,800

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NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970	5	Additional Resources Requested for 1972
<u>Man-Years Amount</u>		<u>Positions</u>
		Amount
		\$105,500

Base Resources
to be reallocated

Man-Years Amount

Project Description

Ecological and Systematic Study of Coralline Algae.
 Widespread pollution and degradation of rocky and coral coasts cannot be realistically avoided unless steps are taken immediately to increase our biological understanding of these areas. Before too many undesirable and far reaching biological changes occur in these environments, it is imperative that study of such areas be greatly increased and that we learn more about the coralline algae which are the most stable members of this environment.

Although the Smithsonian Institution has been carrying an extensive study of these corallines, it is essential that this program be expanded and extended. The preliminary investigation, already initiated with scattered stations, is biosystematic and includes the study of the anatomy, the cytology, and the reproduction on a population basis. The quantitative study of coralline ecology, on a phylogeographic level, should be initiated in the summer of 1971. Most important, the simultaneous laboratory studies of the organisms, so critical to an understanding of the processes involved, should be continued and measurements made of the environmental variables in coralline micro-habitats.

If these studies are not expanded now, before the problems of rocky shore pollution become more acute, there will be insufficient time to build up base-level knowledge of these important organisms. This information will provide the background data required to plan and develop the necessary abatement programs which will be undertaken by the Federal and state governments, private research institutions and industrial and industry-wide development groups.

Program Category I a

This project will require 5 new positions: 1 GS-9 museum technician, 3 GS-4 museum aids, and 1 GS-4 secretary; however, only the museum technician will be full time, the museum aids accounting for one full man-year between them and the secretary accounting for only one-third of a man-year. Equipment would be a cost the first year only and would be broken down for the laboratory in the amount of \$30,200 and for the field \$33,600. Fuel for generators, compressors, etc., would be approximately \$2,500. It would cost \$1,500 for shipping of field equipment to station and research vessel and specimens to USNM. It would be necessary to use \$10,000 for support of "floating laboratory" R/V Melobesia, \$5,000 for lease of field lab and personnel quarters, and \$1,500 for maintenance of lab and diving equipment.

Budget:	
Personnel	\$ 19,100
Travel	800
Transportation of goods	1,500
Other services	16,500
Supplies	3,800
Equipment	<u>63,800</u>
Total	\$105,500

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
					2	\$33,300

Study of the Substrate of Coral Reefs. Drastic, biological changes are occurring on many coral reefs throughout the world. Some scientists attribute these changes to man's interference with the natural environment, but others caution that these changes may be wholly natural. Should the changes be natural, efforts to reverse or halt the changes may do more harm to the world's biologic system than permitting them to proceed without alteration. An evaluation of the origin of these changes cannot be made without a thorough understanding of the ecology of coral reefs. Although many scientists throughout the world are studying the animals and plants which make up the coral reef, very little research is being done on the solid rock framework of the coral reef itself. A study of this framework will make it possible to know the history of the reef and will permit predictions on the effects of various external factors on the life of the reef. The Smithsonian Institution has biologists working on the reef, but it is essential that we coordinate our research with a research program devoted to a study of the reef rock. The laboratory and related facilities needed for a program of basic research in carbonate sedimentology are all virtually already available.

Two new positions would be required for this project: 1 carbonate sedimentologist, GS-13, and 1 museum aid, GS-4. Funds for equipment (\$5,800) would be needed for the first year only.

Program Category I a

Budget:

Personnel
Travel
Supplies
Equipment

\$24,300
2,500
700
5,800
Total \$33,300



NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

	Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Project Description</u>	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

9

\$107,900

The Evolution of Marine Ecosystems. Man's new awareness of his role in the destruction of natural environments and ecological systems has concentrated the national scientific effort on this problem. Proper analysis of the causes and cures of environmental decline demand an evaluation of the effects of human activity on environmental changes, and a thorough understanding of the natural evolution of the environment, but the latter has received relatively little attention. The geological record of physical and biological evolution of the environment is remarkably complete and clearly shows continuous change in the interrelationships between organisms and their habitat--the ecosystem. Detailed analysis of natural environments through time, preserved in rocks and fossil organisms, will provide data on kinds, rates, causes and prediction of natural environmental changes so critical to interpreting the modern situation. With such information man's destruction role can be clearly identified and evaluated, and actions necessary for the prevention of man made and natural environmental catastrophes can be suggested.

The marine shelf areas of the world constitute one of the most threatened natural environments, in particular densely populated industrial areas like the Atlantic Coast of the United States. As a model of the potential role of geology and paleobiology in the interpretation and prediction of environmental changes, it is proposed to study in detail the evolution of natural environments on the Atlantic Shelf from the time of origin of its present biotas and physical configuration

Program Category I a - \$80,900

I b - \$27,000

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(about 150 million years ago) to the present. A complete, well exposed physical record and rich fossil biotas are available along the Atlantic Coastal Plain for this purpose. Biologic studies will be concentrated on mollusca - the dominant, and environmentally most sensitive marine shelf organism. Completed preliminary studies have demonstrated clearly both the feasibility and immediate value of the information which would be developed under this project. This information is needed by the scientists who are evaluating and attempting to control our environment.

Nine new positions as follows will be required for this project: 1 paleobiologist (Cenozoic Marine Gastropod Specialist) GS-12, 1 paleontologist (Permian-early Mesozoic Bivalve Specialist) GS-12, 1 paleontologist (Molluscan Ecologist and Paleocologist) GS-12, 3 geologists (junior grade for ship-board and field data collectors) (part-time to collectively account for 1.5 man-year) GS-9, and 3 museum aides GS-4. Computer time in the amount of \$1,000 and ship time in the amount of \$5,000 will be required. Microscopes, field and Scuba gear, and laboratory equipment will be needed at a cost of \$6,000 and storage cases and drawers to house collections at a cost of \$3,200. Requirements for Program Category Ia will account for 75%, approximately \$80,900, and for Program Category Ib for 25%, approximately \$27,000.

Budget:	
Personnel	\$ 80,900
Travel	6,000
Other services	6,000
Supplies	6,000
Equipment	<u>9,200</u>
Total	\$107,900



NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount
2 \$30,900

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

Biology, Evolution, and Ecology of the Bony Fish.
It is imperative that research be expanded on the biology, evolution, and ecology of the bony fish. The importance of these animals is not only because they constitute such a large part of man's diet, but also because they are currently the most diversified and fastest evolving vertebrates on the planet. Unfortunately, very little work is being done in this country on the history of the bony fish (which includes all the edible fish). Although the National Museum of Natural History has extensive collections of fossil fish, no one on the staff is exclusively studying them. Much important research is being done in the Department of Vertebrate Zoology on the living fish but without more knowledge of the fossils, fishery experts are handicapped in their efforts to make predictions on the factors influencing distribution and extinction of species. Furthermore, study of the fossil fish will yield vital information to science on the mechanisms of speciation, distribution of past faunas, and interrelationships of marine life.

For this project, 2 new positions (1 paleontologist, GS-13, and 1 research assistant, GS-4) will be required. Equipment needed will be microscopes (\$3,000) and cases (\$1,600). Program Category Ia requirements would account for approximately one-half (\$15,500) of the total budget and Program Category Ib for the other half (\$15,400).

I a - \$15,500

I b - \$15,400

Program Category



Budget:

Personnel
Travel
Supplies
Equipment

\$24,300
1,000
1,000
4,600
\$30,900

Total



NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount
1 \$20,600

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

The Abyssal Ostracode Program. The abyssal ostracodes represent a small but important part of the living fauna and fossil record of the ocean floor. The Ostracoda, microscopic crustaceans that have been in existence for half a billion years, have responded in their evolutionary history to the major events of the formation of seas, oceans, and drifting continents. Their use is well established in mapping the formation of shallower sedimentary deposits in oil wells and oceanographic core samples. In the deep sea they are among a very few forms of present life of which fossils are known.

The importance of the proposed study of deep-ocean or abyssal ostracodes is: (1) they provide a rare opportunity to examine basic genetic isolation mechanisms in a thermally reduced environment over a long period of time--potentially arrested gene flow; (2) the recognition of ancient oceans that have been destroyed by mountain building in the formation of new continental complexes, and (3) as an instrument in refining man's ability to understand natural but severe environmental change and its long term effect on the histories of organisms.

The major effort in this country is the study of deep-sea or abyssal ostracodes and their fossil record is centered here in the Smithsonian. The National Museum of Natural History laboratory (the only one of its kind in the nation) now has specimens and sample material from many major ocean expeditions and numerous geological surveys from all over the world. The information that

Program Category
I a - \$15,400
I c - \$5,200

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<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description

could be made available from an analysis of this material would be of vital use to ecologists and ecologists studying the history of the ocean floor and the animals that have lived on it.

This project would require 1 new position, a research assistant, GS-9. Computer and scanning electron microscope services would be needed at a cost of \$800. Publication (photo plates) would cost \$500. Equipment as follows would be required to a total of \$4,700: storage, museum case, containers \$1,200; field equipment, processing apparatus \$2,500; permanent apparatus, microscope accessories, analytical equipment \$1,000. Program Category Ia requirements would account for approximately 75% (\$15,400) of the total budget and Program Category Ic approximately 25% (\$5,200) of the budget.

Budget:	
Personnel	\$10,600
Travel	3,200
Other services	1,300
Supplies	800
Equipment	<u>4,700</u>
Total	<u>\$20,600</u>





<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

the development of information on Pacific Ocean birds and care of the specimens from that area was supported by funds from other agencies and institutions during the years 1962-1970.

In order to maintain and make available for study the museum's large collections of seabirds whose research value has been greatly enhanced by the placing of the data associated with them in a computer system, it is necessary to provide for one new curatorial position, a museum technician, GS-7. Computer time in the amount of \$1,000 will also be required. Of the total budget for this project, approximately 20%, \$2,300, will be accounted for under Program Category Ia, and 80%, \$9,400, under Program Category II.

Budget:

Personnel	\$ 8,700
Other services	1,000
Supplies	1,000
Equipment	1,000
Total	<u>\$11,700</u>



Increases for 1972 by Project

<u>Level of Effort</u> <u>in 1970</u>	<u>Base Resources</u> <u>to be reallocated</u>	<u>Additional Resources</u> <u>Requested for 1972</u>
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> <u>Amount</u>

6 \$88,100

Project Description

Development of National Marine Mammal Study Center.

Since the dawn of civilization man has utilized marine mammals as a source of food and other products. Porpoises, dolphins, whales, and seals are now becoming increasingly valuable in providing basic information essential to man's exploration and occupation of the oceans and the sea floor. The study of their physiological mechanisms, particularly their deep diving adaptations, astonishingly discriminant sonar, and their ability to communicate through water, will provide clues to new techniques for ocean exploitation.

If we are to develop their potential as monitors of pollution of the marine environment, and continue to use them as a source of food, high grade oils, furs, and other products, we must immediately make marine mammals the subject of intensive research. We must be able to identify them more precisely and to learn their systematic relationships, where they occur and why, what schedules they follow in their movements, and their social structure and behavioral patterns. It is vital that we also learn how these mammals have adapted to survive in an environment that man finds hostile, and the evolutionary steps they went through in achieving these adaptations.

To the discredit of man, the exploitation of marine mammals has been mostly heedless of biological realities, so that one population after another has been depleted or exterminated. Today these animals face even greater dangers from pollution of their environment and destruction of their food sources. The world may lose these valuable animals before we discover their full potential or know enough about them to protect them.

<u>Program Category</u>	I	a-	\$17,600
	II	b-	\$17,600
	II	-	\$52,900



<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description

Marine mammals are poorly known chiefly because the costs of studies of them in the field and in the museum are too great for institutions such as universities and small museums to bear. A center with facilities and staff to pursue an effective research program leading to a fuller understanding of these animals is clearly needed. Faced with these needs American scientists such as those of the Woods Hole Oceanographic Institution, Johns Hopkins University and the Oceanic Institute in Hawaii have banded together to urge the Smithsonian to give leadership to the development of such a facility.

From 1878 to 1962 the National Museum developed the world's largest and most comprehensive collections of fossil and recent marine mammals, the finest library pertaining to them, and a staff of scientists with international recognition as leaders in marine mammal systematics and conservation.

Now in response to the urgent need of American scientists, the Museum is again accepting specimens for processing and storage, using inadequate equipment and temporary reassignment of technicians. In these times when marine mammals and their environment are the objects of national concern it is important that the potential of the Smithsonian in this area be fully utilized. The Institution must enhance its research competence and international leadership in marine mammalogy through field and laboratory research in ecology and natural history, systematics and evolution, and anatomy and adaptation. This would facilitate studies of marine mammals by the scientific community by making available its preparation, storage, and study areas and data bank.



Level of Effort in 1970
Man-Years Amount

Base Resources to be reallocated
Man-Years Amount

Additional Resources Requested for 1972
Positions Amount

Project Description

The first year's budget will permit funds for staffing (six new positions: 1 paleontologist, GS-13; 1 neontologist, GS-13; 3 museum technicians, GS-7; and 1 clerk-typist, GS-5) and for developing modular facilities in anticipation of the move of the Marine Mammal Study Center to permanent quarters in a subsequent year. Equipment required will be modular shelving, cases, and deep freeze. Costs for computer time is expected to be about \$3,000. The budget will increase to about \$100,000 per annum when the research program is fully developed and the center is housed in permanent quarters. Allocations from budget costs for the first year will be: Program Category Ia, approximately 20%, \$17,600; Program Category Ib, approximately 20%, \$17,600; and Program Category II, approximately 60%, \$52,900.

Budget:

Personnel	\$69,100
Travel	2,000
Other services	3,000
Supplies	5,000
Equipment	<u>9,000</u>
Total	\$88,100



NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
		3 \$42,200

Project Description

Endangered Freshwater Fishes of South America: Systematic, Ecological, and Biogeographic Research.
 The inland lakes, streams and rivers of South America, which have the largest fresh water fish fauna of any continent are endangered by the increasing encroachment of civilization and accompanying environmental disturbances. Studies of the kinds and diversity of fish species, their geographic distributions, and their ecological requirements would be based on existing collections and data in the Smithsonian and other museums and on field studies. Cooperation with South American and other institutions and training programs for South American ichthyologists would be instituted to train scientists in those countries to carry on these programs in the future in cooperation with institutions in this country with local funding in each case.

The need for this project is urgent. South America is developing rapidly, and there is already much concern over decimation of many areas. The fish fauna is estimated to comprise about 5000 species, about 10 times the number in North America, but our knowledge of this fauna is still only fragmentary. It is at about the same stage as that of the North American fish fauna 100 years ago. Many species remain to be described and some may become extinct before discovery. Fish are important as food and as part of the ecological balance of aquatic ecosystems.

<u>Program Category</u>	I a -	\$31,700
	II -	\$10,500



<u>Level of Effort</u> in 1970.	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

Project Description

As a result of the aquarium trade, some South American species have been introduced into North American waters, a few of them to the detriment of our native fauna and environment. The South American Piranna and the Old World "walking catfish" are examples of introduced species on which insufficient information was available prior to their introduction into this country. It is essential to learn more about the species in their native areas to provide data for control in the United States. Similarly, great alteration of fresh water habitats has already occurred in South America following introductions of Northern Hemisphere fishes such as carp, goldfish, and trout.

Such of the aquatic environment in South America is deficient in calcium carbonate, producing a delicate ecological balance that is highly susceptible to pollution. The potential effects of human population growth and urbanization on fresh water fishes in South America and the role of fishes in changing habitats can be assessed only when basic information on the systematics and ecology of fishes is available.

Three new positions would be required: a zoologist, IS-13; a museum technician, GS-7; and a secretary, IS-5. Illustrations and computer services required would be \$3,000. Beginning in fiscal year 1973, a field program would be initiated. The total annual cost of the entire project would be \$65,000. For the first year, the requirements of Program Category Ia would be about \$75%, \$31,700 and those of Program Category II about 25%, \$ 10,500.



Budget:	
Personnel	\$33,700
Travel	1,500
Other services	3,000
Equipment	<u>4,000</u>
Total	\$42,200



NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u> <u>Man-Years Amount</u>	<u>Base Resources to be reallocated</u> <u>Man-Years Amount</u>	<u>Additional Resources Requested for 1972</u> <u>Positions</u> <u>Amount</u>
			1 \$13,700

Comparative Taxonomic Inventory of Indo-Pacific

Marine Reef Fishes. Increased human population growth and associated industrial growth in coastal areas threaten the coral reef environment in the Indo-Pacific region. This vast area comprises about one-half of the earth's fish fauna. Most of this fauna is associated with the extensive coral reefs of the area. Reefs are being destroyed to create ship channels, and coastal docking areas are being polluted by human waste and shipping refuse. Recent population explosions of the "crown-of-thorns" starfish, in part as a result of human interference threaten vast coral reef areas. Inventories of the fishes of the coral reefs of the Indo-Pacific region are needed now while these reefs are still in a relatively undisturbed state. Knowledge of these faunas will provide valuable baseline data and enable ecologists to assess the effects of human encroachment and thus permit the development of intelligent plans to avoid widespread disastrous results of human actions.

The MNH houses one of the world's largest collections of Indo-Pacific reef fishes. Of these over 20,000 lots of specimens are unsorted and unidentified. These collections would serve as the starting point for an inventory of the fishes of the area.

The first stage of the project would be the sorting and identification of the material acquired as a result of international oceanographic programs such as the International Indian Ocean Expedition and to

<u>Program Category</u>	<u>I a - \$2,700</u>	<u>II - \$11,000</u>
	0	0
	0	0
	0	0
	0	0



<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
	<u>Amount</u>	<u>Amount</u>	<u>Amount</u>

prepare lists of fish species by geographic areas within the Indo-Pacific. The second stage would consist of field collecting expeditions to acquire fishes from little known areas. In fiscal year 1972 one technical aide, a GS-7 museum technician, would be required for sorting and identifying material. Computer time and laboratory and equipment supplies would also be needed. The field work which would begin in fiscal year 1973 would require two additional aides, a supervisory technician, ship time, travel, computer time, field supplies, and equipment and additional laboratory supplies. Three new positions would be needed in fiscal year 1973. The annual budget on a continuing basis would be \$90,000 per year, with the cost in fiscal year 1973 being somewhat higher due to the expense involved in the operation of the ship to make collections.

Budget for fiscal year 1972:	
Personnel	\$ 8,700
Supplies	<u>5,000</u>
Total	\$13,700



NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u>
		Amount
		\$72,400

Project Description

Systematic and Ecological Research on Tropical Birds and Mammals. Knowledge of the biology of many species of Old World tropical birds and mammals is rudimentary. Detailed studies of the ecology of birds and mammals in undisturbed tropical habitat are few. In mammals, even elementary habitat and faunistic information is lacking for many species and areas. Although basic taxonomy and general distribution of tropical birds has been well studied by an earlier generation of scientists, most of what we know about molt, breeding cycles, migration, population structure, ecological interactions, structural and physiological adaptation, and the process of speciation, is based on temperate zone species, which in general are specially adapted to regions of seasonal change. The poorly known tropical species are far more numerous and they represent the stem groups from which many specialized temperate species evolved. Increased knowledge of tropical mammals and birds is therefore of primary scientific importance.

<u>Program Category</u>	I a - \$29,000
	I b - \$29,000
	II - \$14,400

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<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
		<u>Amount</u>	<u>Amount</u>

One approach to problems of evolution and environmental adaptation is through biological comparison of the three major tropical regions of the world. Considerable work on the birds and mammals of the New World tropics is in progress in NMNH, STRI, and other research centers, but increased effort is needed in tropical Africa and Asia to provide a basis for comparison. In addition, the systematic relationships among tropical families of the world must be better known to support sound conclusions in evolutionary, ecological, and zoogeographical studies. The two scientists requested under this program would engage in basic research along these lines.

The rate of destruction of natural habitats in Africa and tropical Asia through economic development and the use of pesticides and herbicides is such that the opportunity to make biological studies will be gone forever within one or two decades in many areas.

Less than ten years ago, NMNH had four world-known research specialists in Old World tropical birds and mammals;

Level of Effort
in 1970

<u>Man-Years</u>	<u>Amount</u>
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Base Resources
to be reallocated

<u>Man-Years</u>	<u>Amount</u>
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Additional Resources
Requested for 1972

<u>Positions</u>	<u>Amount</u>
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Project Description

today we have only one. This program is intended not only to restore our research competence and leadership but also to provide identification and other information services relevant to biomedical, ecological, and conservation programs sponsored by other government agencies.

The collections of Old World tropical birds and mammals in NMNH are outstanding both in older material collected over 80 years ago and in recently collected specimens. The collections continue to grow through systematic, ecological, and public health studies sponsored by such agencies as AID, Department of Defense, SEATO, the World Bank, the International Biological Program, and natural history museums in Asia and Africa. These collections should be maintained so that the specimens and related data are readily accessible to scientists working in various fields of research in this country and throughout the world.

Current needs for research, service, and curation related to the Old World tropics could be met by two new professional positions (2 zoologist, GS-13, on a specialist in Asian and African birds the other in Southeast mammals) and two new support positions (2 museum technicians, GS-7).

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<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
<u>Amount</u>	<u>Amount</u>	<u>Amount</u>

Project Description

Illustrations would require \$2,000, and computer time \$3,000. Program Categories Ia and Ib would account for approximately 40% each of the total budget, or \$29,000 and \$29,000, respectively; Program Category II would account for approximately 20% or \$14,400.

Budget:

Personnel	\$ 53,400
Travel	2,000
Other services	5,000
Supplies	2,000
Equipment	<u>10,000</u>
Total	\$72,400

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>
		\$5,000

Project Description

Systematic Research on Freshwater Amphibians and Reptiles. The rapid disappearance of unpolluted freshwater streams has increased the value of the museum's extensive older collections of freshwater frogs, salamanders, turtles and crocodilians. The collections provide an irreplaceable source of baseline environmental data, such as: distribution and relative densities of locally extirpated species; their former food habits including samples of microfaunas and floras which may likewise have been extirpated; and changes in pollutant levels in body tissues through time. It is of urgent importance both to improve the accessibility of data in these older collections through systematic studies and to add new current baseline material to the collections while the animals remain in relatively clean waters. Large collections of North and South American amphibians and reptiles must be studied, identified and curated before environmental data can be made available to scientists in governmental and private research institutions who require it in support of their studies of the environment. In addition, new collections coming into the museum as a result of current large scale ecological and faunal surveys must be processed promptly to develop the data needed.

This project would require \$1,000 in bottles, \$1,000 in tanks, and \$3,000 in computer time. Program Category Ia would account for approximately 50%, \$2,500 of the total budget; Program Category Ib 25% or \$1,200, and Program Category II 25% or \$1,300.

<u>Program Category</u>	I a - \$2,500
	I b - \$1,200
	II - \$1,300
	0
	0
	0

Budget:

Other services	\$3,000
Supplies	1,000
Equipment	1,000
Total	<u>\$5,000</u>

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
		2 \$38,700

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

Project Description

Systematic Research on Sharks and Rays. Information on the systematics and biology of sharks and rays is of importance to investigators in many fields. These fishes are used as experimental animals by physiologists, behaviorists and biochemists. Shark attacks are a continuing problem in terms of military operations and recreational activities. Some scavenger species are important in recycling solid wastes from cities which are dumped into the sea, while other species serve as food. The NMNH houses the largest collection of sharks and rays in the world. Because of their large size, few museums can keep shark specimens and they must generally be studied where they are because of problems of shipment. The species are difficult to distinguish and combined museum and field study is necessary to clarify systematic and ecological problems. For several years systematic studies of sharks have been conducted in NMNH supported by the Office of Naval Research and Bureau of Commercial Fisheries, but this support will cease by June 1971. However, scientists in government agencies, universities and private research institutions will continue to look to the National Museum of Natural History for information on the systematics and habits of sharks. It is an obligation of the National Museum to perform this valuable service to the scientific community--and to the public whose concern mounts as recreational activities increase. The curation of the extensive collections of these large fish must be maintained in order to meet these needs.

<u>Program Category</u>	I a - \$ 7,700
	I b - \$19,400
	II - \$11,600

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description

This project would require two new positions: a zoologist, GS-13, and a museum technician, GS-7. Illustrations for publications would require \$1,500, tanks \$4,000, and computer time \$2,000. Program Category Ia would account for approximately 20% of the total budget, or \$7,700; Program Category Ib for approximately 50%, or \$19,400; Program Category II for approximately 30%, or \$11,600.

Budget:	
Personnel	\$26,700
Travel	1,000
Other services	3,500
Supplies	1,000
Equipment	<u>6,500</u>
Total	<u>\$38,700</u>

Ib Evolutionary Studies

<u>Item</u>	<u>Position</u>	<u>Amount</u>	<u>Page No.</u>
(1) Expansion of Studies of the Vegetation of Dominica	1.0	13.5	54
(2) Development of Interdisciplinary Team Approach to Research on Marine Biology	3.0	26.6	56
(3) Development of Basic Taxonomic Information on Flowering Plants	1.0	14.1	57
(4) Preparation of a Manual to the Mosses of South America	1.0	7.0	59
(5) Basic Studies of the Morphology and Anatomy of the Bamboo and Other Grasses	1.0	26.6	60
(6) Investigation of the Biological Interrelationships of Plant Feeding Insects	0.3	7.6	62
(7) Expanded Studies of Pollinating Insects and Their Relationships to Increasing Crop Yields	1.0	11.9	64
(8) Studies on the Increasing Use of Biological Control Agents in lieu of Pesticides	1.0	12.9	66
(9) Study of the Role of Soil Arthropods in the Food Chain and as Indispensable Agents of Conversion of Organic Debris	2.5	34.9	68
(10) Studies of Aquatic Insects and Their Role in the Food Chain and as Pollution Indicators	1.2	17.8	70
(11) Biology of Shallow Water and Estuarine Marine Invertebrates	2.0	20.7	72
(12) Invertebrates from the International Indian Ocean Expeditions	1.0	17.0	74

Ib Evolutionary Studies (Cont'd)

<u>Item</u>	<u>Position</u>	<u>Amount</u>	<u>Page No.</u>
(13) Research on Panamanian Marine Invertebrates	3.0	19.0	76
(14) Studies on Freshwater Environments in the United States	1.0	10.5	77
(15) Increase in Research Capability to Meet Special Needs	1.0	15.8	78
(16) Biology of Organisms of the Open Ocean	3.0	30.0	79
(17) Structure and Function of Invertebrate Organisms	3.0	93.8	80
(18) Parasitology	2.0	27.7	81
(19) The Evolution of Marine Ecosystems	2.0	27.0	82
(20) Biology, Evolution and Ecology of the Bony Fish	1.0	15.4	84
(21) Relationships of Heredity and Environment in Evolution as Revealed by the Study of Colonial Invertebrate Animals	2.0	67.3	86
(22) Development of National Marine Mammal Study Center	1.0	17.6	88
(23) Systematic and Ecological Research on Tropical Birds and Mammals	2.0	29.0	91
(24) Systematic Research on Freshwater Amphibians and Reptiles	--	1.2	95
(25) Systematic Research on Sharks and Rays	1.0	19.4	96
(26) Basic Research on the Functional Anatomy of Birds, Reptiles and Amphibians	--	1.0	98
Total--Evolutionary Studies	38.0	585.3	

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort</u>	<u>Base Resources</u>	<u>Additional Resources</u>
	<u>in 1970</u>	<u>to be reallocated</u>	<u>Requested for 1972</u>
	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

2 \$25,700

Expansion of Studies of the Vegetation of Dominica. A floristic study of the vegetation of Dominica, a tropical, forested island in the West Indies, has been underway as an official Smithsonian project since 1954. The goal is completion of a systematic publication on the dicotyledonous plants. There is no comparable earlier coverage for this island. The project is urgent in the face of logging operations which are rapidly changing the island.

Revisionary works in Araceae are needed to complete knowledge of this family which, in addition to broadening botanical knowledge generally, is an important and taxonomically difficult element in tropical forest vegetation, and also important economically as a source of human food starch and for garden ornamentation.

One research assistant, GS-9, will be needed during the completion of the study, and a museum technician, GS-7, plus an increase for computer services required to continue the present computer management of transactions and provide more and better specimen data to the scientific community. Phase I, which falls into Program Category Ib, will require financial support of \$13,500; Phase II, which falls into Program Category II, will require \$12,200.

Program Category I b \$13,500
II \$12,200

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Budget:	
Personnel	\$19,300
Travel	1,500
Other services	3,400
Supplies	700
Equipment	<u>800</u>
Total	\$25,700



Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

3 \$26,600

.05

Development of Interdisciplinary Team Approach to Research on Marine Biology. Marine biologists have convincingly shown that the algology resources of the National Museum of Natural History can be utilized successfully for a broadly-based program of basic research. This would include unifying marine flora concepts on a worldwide basis, combining algologists in research teams such as those studying the Acanthaster ("Crown of Thorns" Starfish) problem, and using the taxonomically complete Dawson Library available in the Museum as the information basis for an oceanwide data bank. A collecting program would be developed that would be directed to attacking difficult problems of the outer reef intertidal areas and to establish a basis for monitoring long-term changes caused by pollution and other ecological factors. Studies on the taxonomic problems related to the material collected in this program would also be undertaken. The professional staff required for this program is available in the museum but three additional technical support positions (2 museum technicians, GS-7, and one computer Programmer, GS-8) would be needed.

Program Category I b

Budget:

Personnel	\$23,600
Travel	<u>3,000</u>
Total	\$26,600

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount

1 \$14,100

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

Development of Basic Taxonomic Information on Flowering Plants. Scientists in many fields have an increasing need for comprehensive taxonomic information on families, on genera, and on species of flowering plants. Modern revisionary works provide the necessary knowledge to put existing collections and already described species into systematic order. This is essential for the stabilization of plant names, the evaluation of newly discovered taxa, and the accurate association of new information of any kind with the appropriate plants. The orderly storage and retrieval of all information on flowering plants depend upon objective taxonomic systems in revisionary monographs. These systems are the primary resource for all computer-oriented data banks dealing with botanical subjects. Techniques for electronic data processing have progressed in sophistication far beyond the ability of botanists to provide data. Revisionary studies urgently are needed so that botanical information can be integrated with advances in other biological fields for proper application to ecological, behavioral, evolutionary, conservation, and economic investigations.

One new position, a research assistant, GS-9, and an additional piece of equipment, a phase contrast microscope, would be needed.

Program Category I b

Budget:

Personnel
Travel
Supplies
Equipment

\$10,600
1,300
200
2,000
\$14,100

Total

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort</u>	<u>Base Resources</u>	<u>Additional Resources</u>
	<u>in 1970</u>	<u>to be reallocated</u>	<u>Requested for 1972</u>
	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
			1 \$7,000

Preparation of a Manual to the Mosses of South America. In order to meet requests from South American botanists it is essential that we prepare introductory manuals to the mosses of that area. Wide distribution of the species makes a treatment on a Continental basis most logical. As time and facilities permit, the descriptions and distribution records of South American mosses would be accumulated and working copies of keys and descriptions prepared. Ultimately, the materials of the U.S. National Collections, plus the complete collections of the New York Botanic Gardens and the Arnold Arboretum of Harvard, will be consulted. The result would provide a solid basis of data for use by South American workers and other students of mosses in this and other countries throughout the world.

Budget:
Salaries (Research Assistant, GS-5) \$7,000
Total \$7,000

Program Category I b

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Increases for 1972 by Project

Project Description	Level of Effort	Bases Resources	Additional Resources
	in 1970	to be reallocated	Requested for 1972
	Man-Years Amount	Man-Years Amount	Positions Amount
Basic Studies of the Morphology and Anatomy of the Bamboos and Other Grasses. Of all plants, grasses are the most important economically to man. Among the approximately ten thousand species, the largest of all in stature are the bamboos. Bamboos are vital to the economy of many regions, especially Japan and all of southeast Asia, where they serve a multitude of purposes ranging from food, to construction, to providing the raw materials for making paper.			1
			\$26,600

Basic Studies of the Morphology and Anatomy of the Bamboos and Other Grasses. Of all plants, grasses are the most important economically to man. Among the approximately ten thousand species, the largest of all in stature are the bamboos. Bamboos are vital to the economy of many regions, especially Japan and all of southeast Asia, where they serve a multitude of purposes ranging from food, to construction, to providing the raw materials for making paper.

Environmental studies which have become increasingly important will have to take into consideration the role of grasses. Because of their ubiquity, grasses also play an important role in most vegetation analyses and ecological studies.

Although grasses have traditionally been classified by means of their flowering process, this has proved to be especially difficult in woody bamboos which may flower as infrequently as once in a century. Emphasis has more recently been placed on such vegetative features as culm sheath morphology, branching habit, and rhizome type, but they still remain the most incompletely known of all grasses. A survey of the leaf anatomy, coupled with analyses of the spikelet morphology of each genus of Bambusoideae would be a first step in elucidating relationships within the subfamily. A better understanding of this group has the utmost practical significance since much of the world's food supply depends directly or indirectly on the production annually of many of

Program Category I b

of the grasses and an increase in production is needed to meet the growing world problem of an adequate food supply. Since bamboos are the most primitive of grasses, an understanding of them is the key to a proper interpretation of evolutionary sequences of the entire grass family.

Outstanding requirements would be 1 new position (a research assistant, GS-8) and illustrations for publication (200 plates).

Budget:	
Personnel	\$ 9,600
Travel	6,000
Other services	10,000
Supplies	300
Equipment	700
Total	<u>\$26,600</u>

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NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated Man-Years Amount	<u>Additional Resources</u> Requested for 1972 Positions Amount
0.6	1.1 \$8,500	1 \$22,900

Project Description

Investigation of the biological inter-relationships of plant feeding insects.

Studies of plant feeding insects have in recent years provided much basic biological knowledge of such natural phenomena as host specificity, host transmissibility, isolating mechanisms and polymorphism. In addition, considerable information regarding the systematic relationship of the host plants can be acquired through a careful study of their associated insect pests. Numerous species of herbivorous insects are serious pests of agricultural crops and ornamental plants. In the United States alone, destruction caused by these pests amounts to more than two billion dollars each year. Without the various means of chemical control now utilized, the estimated losses would soar considerably higher. As chemical control for these pests is reduced to lessen environmental pollution, biological control programs must be discovered or improved. Consequently, there exists an urgent need by scientists seeking to develop these controls, for basic biological knowledge of all important insect pests.

Program Category I a - \$8,000

Ib - \$7,600
II - \$7,300

This project would require one new position, a research assistant, GS-7. Costs for equipment would be broken down as follows: binocular microscope, \$1,500; library and office equipment, \$1,000; camera equipment, \$1,500; insect cases and drawers, \$4,200; miscellaneous equipment, \$1,500. *

Budget:	
Personnel	\$ 8,700
Travel	3,000
Supplies	1,500
Equipment	<u>9,700</u>
Total	\$22,900

*Of the total budget, Program Category Ia will account for approximately 35% or \$8,000; Program Category Ib for 33% or \$7,600; and Program Category II for 32% or \$7,300.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
<u>Expanded Studies of Pollinating Insects and Their Relationship to Increasing Crop Yields.</u>	0.4	\$5,600.	0.6	\$6,100	2	\$38,400

The present limited program on behavior, intra-floral relationships and systematics of pollinating insects has resulted in the discovery of the very important and unique role played by certain solitary North and South American bees in the pollination of the squashes and gourds native to the Americas. As a result of the current studies, plans are being made now for the importation and liberation of certain of the American bees into Hawaii and developing countries where the American squashes and gourds are already being cultivated. It is anticipated that this will result in substantially increased crop yields in Hawaii and other countries where bees native to those areas are not effective pollinators. The expansion of studies on pollinating insects is required to provide additional basic data to scientists involved in studies designed to meet the very urgent need for improvement of crop yield due to the ever-burgeoning world population.

Program Category I a - \$21,100

Ib - \$11,900

II - \$5,400

The major requirements for carrying out studies under this project are additional personnel (one entomologist (specialist in Diptera), GS-12, and one research assistant, GS-7) and \$11,200 worth of equipment (binocular microscopes, \$2,500; library, office, and laboratory furniture, \$1,500; camera equipment, \$2,500; insect cases and drawers, \$4,200; and miscellaneous equipment, \$500). Of the total fiscal year 1972 budget, Program Category Ia will account for approximately 55% or \$21,000; Program Category Ib for 31% or \$11,900; and Program Category II for 14% or \$5,400. The annual cost of this proposed expansion in subsequent fiscal years would be \$25,500.

Budget for FY 1972:

Personnel	\$24,000
Travel	2,600
Supplies	600
Equipment	<u>11,200</u>
Total	\$38,400

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
<u>Studies on the increasing use of biological control agents in lieu of pesticides.</u>	0.3	\$5,300	0.6	\$16,100	3	\$46,200

Results achieved so far in this important but minuscule program have demonstrated the substantial possibility of predaceous solitary wasps serving as important agents in the control of insects of economic importance. These wasps prey upon caterpillars, aphids, spiders and other arthropods in tremendous numbers as food for their young. Just one female wasp will use as many as 600 spiders or 250 caterpillars in the brood cells which she will provision. Many of the species preyed upon are important as pests of vegetation, acting as defoliators, leaf miners or sapsuckers, so that the wasps serve as effective biological control agents. Our present urgent concern to lessen environmental pollution now being caused by insecticides and other chemical control methods by substitution of biological agents makes it essential that the expansion of present studies on predaceous and parasitic insects be given increased emphasis immediately. Studies would also be initiated on predaceous beetles, another insect group of major importance as biological control agents.

Program Category I A - \$27,700
I b - \$12,900
II - \$5,600

Additional staffing and equipment resources needed for carrying out this project are: 3 new positions (1 entomologist, GS-12; 1 research assistant, GS-7; and 1 secretary, GS-6) and \$11,200 worth of equipment (microscopes, \$2,500; office, library, and laboratory furniture, \$1,500; camera equipment, \$2,500; insect cases, \$1,000; insect drawers, \$3,200; and miscellaneous equipment, \$500). *

Budget:	
Personnel	\$31,800
Travel	2,600
Supplies	600
Equipment	<u>11,200</u>
Total	\$46,200

*Of the total budget, Program Category Ia will account for approximately 60% or \$27,700; Program Category Ib for 28% or \$12,900; and Program Category II for 12% or \$5,600.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years Amount</u>		<u>Man-Years Amount</u>		<u>Positions</u>	<u>Amount</u>
Study of the role of soil arthropods in the food chain and as indispensable agents of conversion of organic debris.	0	0	1.0	\$10,200	6	\$87,300

Study of the role of soil arthropods in the food chain and as indispensable agents of conversion of organic debris.

Arthropods are one of the most abundant constituents of the soil fauna and flora. Rich soils may harbor more than 10 million arthropods per acre. These animals are very important elements in the food chain of higher organisms. Some are indispensable in conversion of organic debris, thus maintaining the productivity of our environment. Others are important as parasites or predators of other soil animals. Many of them are very sensitive to insecticides and herbicides, thus serving as indicators of soil pollution. Despite their abundance, virtually nothing is known concerning the identity or behavior of these arthropods.

Because of our national priorities in increasing productivity and reducing environmental pollution, there is an urgent need to give increased attention to the studies on these very important components of the soil biota. In order to carry out this project, six new positions will be needed, among them 2 entomologists, GS-12, supported by 1 illustrator (GS-7), 1 research assistant (GS-7), 1 secretary (GS-6), and 1 field technician (GS-5). One entomologist will work on the apterygote insects

Program Category I a - \$45,400

I b - \$34,900

II - \$7,000

(silverfish, springtails, and allies) and the other on the arachnids (mites, spiders, and ticks). Necessary equipment would be microscopes, \$6,700; insect cases, \$2,000; library, office, and laboratory furniture, \$6,600; Mettler balance, \$700; and miscellaneous equipment, \$600. *

Budget:	
Personnel	\$62,800
Travel	4,200
Supplies	3,700
Equipment	<u>16,600</u>
Total	\$87,300

* Of the total budget, Program Category Ia will account for approximately 52% or \$45,400; Program Category Ib for 40% or \$34,900; and Program Category II for 8% or \$7,000.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort in 1970</u>	<u>Man-Years Amount</u>	<u>Base Resources to be reallocated</u>	<u>Man-Years Amount</u>	<u>Additional Resources Requested for 1972</u>	<u>Positions</u>	<u>Amount</u>
0.7	\$11,100	1.2	\$12,400	4		\$59,200

Project Description

Study of Aquatic Insects and their role in the food chain and as pollution indicators.

The present program on aquatic insects occurring in freshwater environments would be expanded by the initiation of studies on aquatic Diptera. Larvae of insects belonging to this order occur in tremendous numbers in freshwater habitats. They are extremely sensitive to all kinds of pollution in their larval habitats so that their presence or absence in a given water source is an indication whether pollution has occurred. Also, because of their abundance, both the larvae and adults of these insects are extremely important elements in the food chain in aquatic habitats. The present national priorities on environmental pollution make it imperative that we augment our present program on aquatic insects now in order to provide basic information to other federal agencies and to other organizations in this country and in the developing countries where this kind of expertise is not available.

In order to expand this program, four new positions will be required as follows:

<u>Program Category I a</u>	-	\$34,300
I b	-	\$17,800
II	-	\$7,100

1 entomologist (specialist on aquatic Diptera), GS-12; an illustrator, GS-7; a research assistant, GS-7; and a secretary, GS-6. The illustrator will assist the entire group working on aquatic insects. Equipment requirements will be binocular microscopes, \$3,500; electric typewriter, \$500; office and laboratory furniture and library, \$5,500; insect cases and drawers, \$4,200; and miscellaneous equipment, \$500. *

Budget:

Personnel	\$40,500
Travel	2,400
Supplies	2,100
Equipment	<u>18,700</u>
Total	\$59,200

* Of the total budget, Program Category Ia will account for approximately 58% or \$34,300; Program Category Ib for 30% or \$17,800; and Program Category II for 12% or \$7,100.

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> Amount

4	\$41,400
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Project Description

Ecology of Shallow Water and Estuarine Marine Invertebrates. Microscopic invertebrates, primarily worms and small crustaceans, comprise a large portion of the bottom-living animals of shallow marine waters. These smaller worms and crustaceans are important food items for larger animals, particularly bottom-feeding fishes. This project would provide basic information for fishery biologists and others seeking to develop and increase the economic value of products obtainable from the sea. The abundance of smaller invertebrates in sediments and their habitat requirements suggest these organisms might be important environmental indicators, but baseline information on their biology, numbers, and occurrence is required in order to assess their importance.

This project will require four new positions: two illustrators, GS-7, and two museum technicians, GS-5. Equipment in the form of slide storage units for \$4,000 will be needed. Program Ia and Ib will account for one-half each (\$20,700 each) of the total budget.

Personnel	\$31,400
Travel	5,000
Supplies	1,000
Equipment	4,000
Total	<u>\$41,400</u>

<u>Program Category</u>	I a - \$20,700
	I b - \$20,700

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

5 \$68,000

Collections from the International Indian Ocean Expeditions. As a result of the International Indian Ocean Expeditions, important collections of invertebrates, particularly crustaceans, sipunculid worms, echinoderms, and mollusks, and midwater fishes from the Indian Ocean are available for study by Museum scientists. These collections are particularly important because they are the most comprehensive ever made in that area. The funds requested would provide support for the study and evaluation of these collections and make the results available to the scientific community in general and in particular to fishery biologists working in the Indian Ocean. Rational exploitation of the world's oceans is dependent precisely on the kinds of information which would result from these studies. Although the International Indian Ocean Expedition was officially designated as a National Program, funds for research on the collections made during the expedition were not made available to Bureau Scientists through the National Science Foundation.

This project will require 5 new positions: 1 illustrator, GS-7; 1 librarian, GS-7; 1 museum technician, GS-5; 1 museum aid, GS-4, and 1 clerk-typist, GS-4. Other expenses will be alcoholic stacks for \$10,000; construction for \$7,500; equipment for \$6,000; and jars, tanks, paper trays, and boxes for \$7,500. Program Category Ia will account for approximately 75% or \$51,000 of the total budget; Program Category Ib for approximately 25% or \$17,000.

Program Category

I a- \$51,000
I b- \$17,000

①
a
b
c
d
e

Budget:

Personnel
Other services
Supplies
Equipment

\$37,000
7,500
7,500
16,000
\$68,000

Total

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort</u>	<u>Base Resources</u>	<u>Additional Resources</u>
	<u>in 1970</u>	<u>to be reallocated</u>	<u>Requested for 1972</u>
	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
	<u>Amount</u>	<u>Amount</u>	<u>Amount</u>

Research on Panamanian Marine Invertebrates. It is essential to expand the research initiated in FY 1971 on the occurrence, relationships, distribution, and abundance of marine invertebrates in the Panamanian region, with emphasis on those groups which might best be utilized as indicators of environmental change upon completion of the proposed canal as well as emphasis on collection of baseline data on all major groups of invertebrates in the Panamanian region.

This project will require six new positions:

- 1 illustrator, GS-7; 2 research assistants, GS-5; and 3 summer aids, GS-3, part-time. Alcoholic storage shelving for \$5,000 and jars for \$2,000 will also be needed. Program Category Ia will require \$19,000 of the \$38,000 budgeted, while Program Category Ib will require the other \$19,000.

Budget:

Personnel	\$26,500
Travel	3,000
Supplies	3,500
Equipment	5,000
Total	\$38,000

Program Category **I a - \$19,000**
 I b - \$19,000

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Increases for 1972 by Project

<u>Level of Effort</u> <u>in 1970</u>	<u>Base Resources</u> <u>to be reallocated</u>	<u>Additional Resources</u> <u>Requested for 1972</u>
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> <u>Amount</u>
		2
		\$26,200

Project Description

Studies on Freshwater Environments in the United States. Additional funds are required to expand studies on invertebrates occurring in freshwater environments in the United States, with particular emphasis on the biology and distribution of crayfishes and associated organisms. These studies will provide basic environmental data on the inhabitants of freshwaters; documentation of the kinds of invertebrates and their numbers in all freshwater habitats is needed to provide basic information required by other Federal agencies and research organizations investigating the quality of the environment in this country.

This project will require two new positions: an illustrator, GS-7, and a research assistant, GS-5. Other requirements will be \$5,000 for alcoholic stocks and \$2,500 for jars. Of the \$26,200 budgeted for this project, Program Category Ia will require 60% of it or approximately \$15,700, while Program Category Ib will require 40% of it or approximately \$10,500.

Program Category Ia - \$15,700
Program Category Ib - \$10,500

Budget:

Personnel	\$15,700
Travel	2,000
Supplies	3,500
Equipment	5,000
Total	\$26,200

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description

Increase in Research Capability to Meet Special Needs. The objective of this project is to diversify research and curatorial programs of the department in the biology and ecology of aquatic organisms without making permanent additions to the Professional research staff. This would broaden the Museum's capabilities in research, to complement existing research and curatorial programs, and would involve the development of a continuing exchange program at the senior level with both universities and other museums. Establishment of this program, in response to changing needs in research expertise, will enhance the Museum's ability to meet current challenges in investigations of the environment and in other areas where additional professional talent is needed from time to time and at the same time avoid the necessity of adding new, long term members of the scientific staff.

2

\$31,500

Program Category I a - \$15,700

I b - \$15,800

This project will require 2 additional positions: 1 systematic zoologist, GS-13, and 1 museum technician, GS-5. Program Category Ia interest in the project will be approximately \$15,700 and Program Category Ib interest will be approximately \$15,800.

Budget:

Personnel	\$25,000
Travel	1,000
Supplies	2,000
Equipment	3,500
<u>Total</u>	<u>\$31,500</u>

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Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> Amount

3 \$30,000

Project Description

Biology of Organisms of the Open Ocean. The objective of this project is to expand basic studies on the occurrence and biology of invertebrates of the open ocean, particularly crustaceans, squids, and larval forms of benthic organisms. Base line data on these organisms, integral parts of food chains in the oceans, is needed by fishery biologists and others investigating the resources of the open ocean. The significance of the proposed studies is illustrated by the fact that many of the smaller invertebrates of the open ocean are utilized as food items by such commercially important fishes as the tunas and jacks.

Three new positions will be required to carry out this project: 1 illustrator, GS-7; 1 museum technician, GS-5; and 1 museum aid, GS-4. Other outstanding requirements are alcoholic stacks for \$5,000 and jars for \$1,500.

Budget:

Personnel	\$22,000
Travel	1,500
Supplies	1,500
Equipment	5,000
Total	<u>\$30,000</u>

Program Category

I b

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9
9

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
Structure and Function of Invertebrate Organisms.					3	\$93,800

Structure and Function of Invertebrate Organisms.
 Basic information on the internal structure of invertebrate animals is required to complement existing research programs on invertebrates as well as to provide a foundation for evaluating the effects of environmental change on these organisms. With our current state of knowledge of the microscopic structure of invertebrates it is impossible to assess or identify internal changes that might be induced by environmental factors. A recent experiment with crayfish, using a cancer-producing chemical compound, showed that changes in the crayfish liver as a result of exposure to the compound could not be properly identified for the normal structure of the liver of the crayfish was not known. The program will be designed to provide such basic information on the microscopic structure of invertebrates.

This project will require 3 new positions: 1 histologist, GS-12; 1 museum technician, GS-7; and 1 clerk-typist, GS-4. Other requirements will be an electron microscope for \$40,000, construction for \$6,000, and miscellaneous supplies for \$15,000.

Budget:

Personnel	\$30,300
Other services	6,000
Supplies	2,500
Equipment	55,000
Total	\$93,800

Program Category I b

Increases for 1972 by Project

Additional Resources Requested for 1972	2	\$27,700
<u>Positions</u>		<u>Amount</u>

Base Resources to be reallocated	<u>Man-Years</u>	<u>Amount</u>
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Level of Effort in 1970	<u>Man-Years</u>	<u>Amount</u>
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Project Description

Parasitology. External parasites and other organisms closely associated with larger aquatic animals, particularly fishes, play an important role in the biology of the larger organisms. Base line data on the numbers and kinds of external parasites infecting aquatic animals is required in order to assess their affects on the biology of the host. This project will be closely coordinated with current research on fishes carried on in the Bureau, and would make available base line environmental data on both parasites and hosts for use by ecologists, biologists, and others in Federal and State agencies, private institutions and industrial consultants engaged in research to develop a better understanding of aquatic life.

This project will require two new positions: 1 illustrator, GS-7, and 1 museum technician, GS-5. Slide storage units in the amount of \$2,000, computer time for \$5,000, and miscellaneous equipment for \$3,000 will also be required.

Budget:

Personnel	\$15,700
Travel	1,000
Other services	5,000
Supplies	1,000
Equipment	5,000
Total	<u>\$27,700</u>

Program Category I b

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NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970	9	Additional Resources Requested for 1972
<u>Man-Years Amount</u>		<u>Positions</u>
<u>Man-Years Amount</u>		<u>Amount</u>
		\$107,900

Base Resources
to be reallocated

Level of Effort
in 1970

Project Description

The Evolution of Marine Ecosystems. Man's new awareness of his role in the destruction of natural environments and ecological systems has concentrated the national scientific effort on this problem. Proper analysis of the causes and cures of environmental decline demand an evaluation of the effects of human activity on environmental changes, and a thorough understanding of the natural evolution of the environment, but the latter has received relatively little attention. The geological record of physical and biological evolution of the environment is remarkably complete and clearly shows continuous change in the interrelationships between organisms and their habitat--the ecosystem. Detailed analysis of natural environments through time, preserved in rocks and fossil organisms, will provide data on kinds, rates, causes and prediction of natural environmental changes so critical to interpreting the modern situation. With such information man's destruction role can be clearly identified and evaluated, and actions necessary for the prevention of man made and natural environmental catastrophes can be suggested.

The marine shelf areas of the world constitute one of the most threatened natural environments, in particular densely populated industrial areas like the Atlantic Coast of the United States. As a model of the potential role of geology and paleobiology in the interpretation and prediction of environmental changes, it is proposed to study in detail the evolution of natural environments on the Atlantic Shelf from the time of origin of its present biotas and physical configuration

<u>Program Category</u>	I a - \$80,900
	I b - \$27,000

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(about 150 million years ago) to the present. A complete, well exposed physical record and rich fossil biotas are available along the Atlantic Coastal Plain for this purpose. Biologic studies will be concentrated on mollusca - the dominant, and environmentally most sensitive marine shelf organism. Completed preliminary studies have demonstrated clearly both the feasibility and immediate value of the information which would be developed under this project. This information is needed by the scientists who are evaluating and attempting to control our environment.

Nine new positions as follows will be required for this project: 1 paleobiologist (Cenozoic Marine Gastropod Specialist) GS-12, 1 paleontologist (Permian-early Mesozoic Bivalve Specialist) GS-12, 1 paleontologist (Molluscan Ecologist and Paleocologist) GS-12, 3 geologists (junior grade for ship-board and field data collectors) (part-time to collectively account for 1.5 man-year) GS-9, and 3 museum aides GS-4. Computer time in the amount of \$1,000 and ship time in the amount of \$5,000 will be required. Microscopes, field and Scuba gear, and laboratory equipment will be needed at a cost of \$6,000 and storage cages and drawers to house collections at a cost of \$3,200. Requirements for Program Category Ia will account for 75%, approximately \$80,900, and for Program Category Ib for 25%, approximately \$27,000.

Budget:

Personnel	\$ 80,900
Travel	6,000
Other services	6,000
Supplies	6,000
Equipment	<u>2,200</u>
Total	\$107,900

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources Requested for 1972
Positions 2
Amount \$30,900

Base Resources to be reallocated
Man-Years Amount

Level of Effort in 1970
Man-Years Amount

Project Description

Biology, Evolution, and Ecology of the Bony Fish.
It is imperative that research be expanded on the biology, evolution, and ecology of the bony fish. The importance of these animals is not only because they constitute such a large part of man's diet, but also because they are currently the most diversified and fastest evolving vertebrates on the planet. Unfortunately, very little work is being done in this country on the history of the bony fish (which includes all the edible fish). Although the National Museum of Natural History has extensive collections of fossil fish, no one on the staff is exclusively studying them. Much important research is being done in the Department of Vertebrate Zoology on the living fish but without more knowledge of the fossils, fishery experts are handicapped in their efforts to make predictions on the factors influencing distribution and extinction of species. Furthermore, study of the fossil fish will yield vital information to science on the mechanisms of speciation, distribution of past faunas, and interrelationships of marine life.

For this project, 2 new positions (1 paleontologist, GS-13, and 1 research assistant, GS-4) will be required. Equipment needed will be microscopes (\$3,000) and cases (\$1,600). Program Category Ia requirements would account for approximately one-half (\$15,500) of the total budget and Program Category Ib for the other half (\$15,400).

I a - \$15,500
I b - \$15,400

Program Category

Budget:

Personnel
Travel
Supplies
Equipment

\$24,300
1,000
1,000
4,600
\$30,900

Total

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

	2	\$67,300
<u>Additional Resources Requested for 1972 Positions</u>		<u>Amount</u>

<u>Base Resources to be reallocated</u>	<u>Man-Years</u>	<u>Amount</u>
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<u>Level of Effort in 1970</u>	<u>Man-Years</u>	<u>Amount</u>
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Project Description

Relationships of Heredity and Environment in Evolution as Revealed by the Study of Colonial Invertebrate Animals. Separation of the relative effects of heredity and environment upon animals continues to be the major unsolved problem in zoology. The genetic makeup of a colony consisting of many individuals of several different kinds is constant throughout, because reproduction of these individuals is asexual. This genetic constancy effectively removes heredity as a contributing factor of variation of comparable structures within the colony and permits direct evaluation of environmental factors on these structures. Thus evaluated, environmental effects can be subtracted in the comparison of different colonies to reveal hereditary differences and patterns of evolution. Both the environmental and evolutionary information can be applied directly to practical problems in ecology and geology.

During the past few years, several investigators working on coordinated separate studies in the National Museum of Natural History have completed exploratory research on the colonial marine invertebrate phylum Bryozoa. This research has demonstrated the value of several coordinated approaches and the need for continuing these studies. Interpretive research which is sufficiently broad in scope to permit the resulting data to be used widely in the scientific community can only be done where large collections are available of fossil and recent specimens. The National Museum of Natural History has the most comprehensive collections of Bryozoa in

Program Category I b

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

Project Description

the world and with but a small addition to its staff can undertake this important work largely within the limits of its present resources.

In order to continue these studies on this collection at a significant pace and within the framework of a coordinated plan, it is proposed to establish funds to invite qualified researchers from the United States and other countries to participate in this research. From experience, a total group of six or seven researchers has proven to be optimal with three or four yearly visitors on a continuing basis. Preliminary estimates indicate that at least forty researchers in thirteen countries have the appropriate qualifications and interest to participate.

This project will require two new positions: 1 laboratory technician, GS-4, and 1 clerk-typist, GS-3. Travel and subsistence for researchers will be regulated so that costs can be estimated as not exceeding \$12,000 per man-year. Computer time at a cost of \$1,000 will be required.

Budget:

Personnel	\$11,800
Travel	48,000
Other services	1,000
Supplies	1,500
Equipment	<u>5,000</u>
Total	\$67,300

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> Amount
		6
		\$88,100

Project Description

Development of National Marine Mammal Study Center.

Since the dawn of civilization man has utilized marine mammals as a source of food and other products. Forpoises, dolphins, whales, and seals are now becoming increasingly valuable in providing basic information essential to man's exploration and occupation of the oceans and the sea floor. The study of their physiological mechanisms, particularly their deep diving adaptations, astonishingly discriminant sonar, and their ability to communicate through water, will provide clues to new techniques for ocean exploitation.

If we are to develop their potential as monitors of pollution of the marine environment, and continue to use them as a source of food, high grade oils, furs, and other products, we must immediately make marine mammals the subject of intensive research. We must be able to identify them more precisely and to learn their systematic relationships, where they occur and why, what schedules they follow in their movements, and their social structure and behavioral patterns. It is vital that we also learn how these mammals have adapted to survive in an environment that man finds hostile, and the evolutionary steps they went through in achieving these adaptations.

To the discredit of man, the exploitation of marine mammals has been mostly heedless of biological realities, so that one population after another has been depleted or exterminated. Today these animals face even greater dangers from pollution of their environment and destruction of their food sources. The world may lose these valuable animals before we discover their full potential or know enough about them to protect them.

Program Category

I	a-	\$17,600
II	b-	\$17,600
	-	\$52,900

<u>Level of Effort</u> in 1970	<u>Man-Years Amount</u>	<u>Base Resources</u> to be reallocated	<u>Man-Years Amount</u>	<u>Additional Resources</u> Requested for 1972	<u>Positions</u>	<u>Amount</u>
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Project Description

Marine mammals are poorly known chiefly because the costs of studies of them in the field and in the museum are too great for institutions such as universities and small museums to bear. A center with facilities and staff to pursue an effective research program leading to a fuller understanding of these animals is clearly needed. Faced with these needs American scientists such as those of the Woods Hole Oceanographic Institution, Johns Hopkins University and the Oceanic Institute in Hawaii have banded together to urge the Smithsonian to give leadership to the development of such a facility.

From 1878 to 1962 the National Museum developed the world's largest and most comprehensive collections of fossil and recent marine mammals, the finest library pertaining to them, and a staff of scientists with international recognition as leaders in marine mammal systematics and conservation.

Now in response to the urgent need of American scientists, the Museum is again accepting specimens for processing and storage, using inadequate equipment and temporary reassignment of technicians. In these times when marine mammals and their environment are the objects of national concern it is important that the potential of the Smithsonian in this area be fully utilized. The Institution must enhance its research competence and international leadership in marine mammalogy through field and laboratory research in ecology and natural history, systematics and evolution, and anatomy and adaptation. This would facilitate studies of marine mammals by the scientific community by making available its preparation, storage, and study areas and data bank.

Level of Effort
in 1970
Man-Years Amount

Base Resources
to be reallocated
Man-Years Amount

Additional Resources
Requested for 1972
Positions Amount

Project Description

The first year's budget will permit funds for staffing (six new positions: 1 paleontologist, GS-13; 1 neontologist, GS-13; 3 museum technicians, GS-7; and 1 clerk-typist, GS-5) and for developing modular facilities in anticipation of the move of the Marine Mammal Study Center to permanent quarters in a subsequent year. Equipment required will be modular shelving, cases, and deep freeze. Costs for computer time is expected to be about \$3,000. The budget will increase to about \$100,000 per annum when the research program is fully developed and the center is housed in permanent quarters. Allocations from budget costs for the first year will be: Program Category Ia, a approximately 20%, \$17,600; Program Category Ib, approximately 20%, \$17,600; and Program Category II, approximately 60%, \$52,900.

Budget:

Personnel	\$69,100
Travel	2,000
Other services	3,000
Supplies	5,000
Equipment	<u>9,000</u>
Total	\$88,100

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
<p><u>Systematic and Ecological Research on Tropical Birds and Mammals.</u> Knowledge of the biology of many species of Old World tropical birds and mammals is rudimentary. Detailed studies of the ecology of birds and mammals in undisturbed tropical habitat are few. In mammals, even elementary habitat and faunistic information is lacking for many species and areas. Although basic taxonomy and general distribution of tropical birds has been well studied by an earlier generation of scientists, most of what we know about molt, breeding cycles, migration, population structure, ecological interactions, structural and physiological adaptation, and the process of speciation, is based on temperate zone species, which in general are specially adapted to regions of seasonal change. The poorly known tropical species are far more numerous and they represent the stem groups from which many specialized temperate species evolved. Increased knowledge of tropical mammals and birds is therefore of primary scientific importance.</p>					4	\$72,400

<u>Program Category</u>	<u>Amount</u>
I a-	\$29,000
I b-	\$29,000
II	\$14,400

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<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>

One approach to problems of evolution and environmental adaptation is through biological comparison of the three major tropical regions of the world. Considerable work on the birds and mammals of the New World tropics is in progress in NMNH, STRI, and other research centers, but increased effort is needed in tropical Africa and Asia to provide a basis for comparison. In addition, the systematic relationships among tropical families of the world must be better known to support sound conclusions in evolutionary, ecological, and zoogeographical studies. The two scientists requested under this program would engage in basic research along these lines.

The rate of destruction of natural habitats in Africa and tropical Asia through economic development and the use of pesticides and herbicides is such that the opportunity to make biological studies will be gone forever within one or two decades in many areas.

Less than ten years ago, NMNH had four world-known research specialists in Old World tropical birds and mammals;

Level of Effort
in 1970

<u>Man-Years</u>	<u>Amount</u>
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Base Resources
to be reallocated

<u>Man-Years</u>	<u>Amount</u>
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Additional Resources
Requested for 1972

<u>Positions</u>	<u>Amount</u>
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Project Description

today we have only one. This program is intended not only to restore our research competence and leadership but also to provide identification and other information services relevant to biomedical, ecological, and conservation programs sponsored by other government agencies.

The collections of Old World tropical birds and mammals in NMNH are outstanding both in older material collected over 80 years ago and in recently collected specimens. The collections continue to grow through systematic, ecological, and public health studies sponsored by such agencies as AID, Department of Defense, SIATO, the World Bank, the International Biological Program, and natural history museums in Asia and Africa. These collections should be maintained so that the specimens and related data are readily accessible to scientists working in various fields of research in this country and throughout the world.

Current needs for research, service, and curation related to the Old World tropics could be met by two new professional positions (2 zoologist, GS-13, on a specialist in Asian and African birds the other in Southeast mammals) and two new support positions (2 museum technicians, GS-7).

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Level of Effort
in 1970
Man-Years Amount

Base Resources
to be reallocated
Man-Years Amount

Additional Resources
Requested for 1972
Positions Amount

Project Description

Illustrations would require \$2,000, and computer time \$3,000. Program Categories Ia and Ib would account for approximately 40% each of the total budget, or \$29,000 and \$29,000, respectively; Program Category II would account for approximately 20% or \$14,400.

Budget:

Personnel	\$ 53,400
Travel	2,000
Other services	5,000
Supplies	2,000
Equipment	<u>10,000</u>
Total	\$72,400

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

\$5,000

Project Description

Systematic Research on Freshwater Amphibians and Reptiles. The rapid disappearance of unpolluted freshwater streams has increased the value of the museum's extensive older collections of freshwater frogs, salamanders, turtles and crocodilians. The collections provide an irreplaceable source of baseline environmental data, such as: distribution and relative densities of locally extirpated species; their former food habits including samples of microfaunas and floras which may likewise have been extirpated; and changes in pollutant levels in body tissues through time. It is of urgent importance both to improve the accessibility of data in these older collections through systematic studies and to add new current baseline material to the collections while the animals remain in relatively clean waters. Large collections of North and South American amphibians and reptiles must be studied, identified and curated before environmental data can be made available to scientists in governmental and private research institutions who require it in support of their studies of the environment. In addition, new collections coming into the museum as a result of current large scale ecological and faunal surveys must be processed promptly to develop the data needed.

This project would require \$1,000 in bottles, \$1,000 in tanks, and \$3,000 in computer time. Program Category Ia would account for approximately 50%, \$2,500 of the total budget; Program Category Ib 25% or \$1,200, and Program Category II 25% or \$1,300.

Budget:

Other services	\$3,000
Supplies	1,000
Equipment	<u>1,000</u>
Total	<u>\$5,000</u>

<u>Program Category</u>	I a - \$2,500
	I b - \$1,200
	II - \$1,300
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NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u>	<u>Base Resources</u>	<u>Additional Resources</u>
<u>in 1970</u>	<u>to be reallocated</u>	<u>Requested for 1972</u>
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
		2
		\$38,700

Project Description

Systematic Research on Sharks and Rays. Information on the systematics and biology of sharks and rays is of importance to investigators in many fields. These fishes are used as experimental animals by physiologists, behaviorists and biochemists. Shark attacks are a continuing problem in terms of military operations and recreational activities. Some scavenger species are important in recycling solid wastes from cities which are dumped into the sea, while other species serve as food. The NMNH houses the largest collection of sharks and rays in the world. Because of their large size, few museums can keep shark specimens and they must generally be studied where they are because of problems of shipment. The species are difficult to distinguish and combined museum and field study is necessary to clarify systematic and ecological problems. For several years systematic studies of sharks have been conducted in NMNH supported by the Office of Naval Research and Bureau of Commercial Fisheries, but this support will cease by June 1971. However, scientists in Government agencies, universities and private research institutions will continue to look to the National Museum of Natural History for information on the systematics and habits of sharks. It is an obligation of the National Museum to perform this valuable service to the scientific community--and to the public whose concern mounts as recreational activities increase. The curation of the extensive collections of these large fish must be maintained in order to meet these needs.

<u>Program Category</u>	<u>I a -</u>	<u>\$ 7,700</u>
	<u>I b -</u>	<u>\$19,400</u>
	<u>II -</u>	<u>\$11,600</u>

Level of Effort
in 1970
Man-Years Amount

Base Resources
to be reallocated
Man-Years Amount

Additional Resources
Requested for 1972
Positions Amount

Project Description

This project would require two new positions: a zoologist, GS-13, and a museum technician, GS-7. Illustrations for publications would require \$1,500, tanks \$4,000, and computer time \$2,000. Program Category Ia would account for approximately 20% of the total budget, or \$7,700; Program Category Ib for approximately 50%, or \$19,400; Program Category II for approximately 30%, or \$11,600.

Budget:

Personnel	\$26,700
Travel	1,000
Other services	3,500
Supplies	1,000
Equipment	6,500
Total	<u>\$38,700</u>

Increases for 1971 by Project

<u>Project Description</u>	<u>Level of Effort</u>	<u>Base Resources</u>	<u>Additional Resources</u>
	<u>in 1969</u>	<u>to be reallocated</u>	<u>Requested for 1971</u>
	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
	<u>Amount</u>	<u>Amount</u>	<u>Amount</u>
<u>Basic Research on the Functional Anatomy of Birds, Reptiles and Amphibians.</u>			\$2,000

Basic Research on the Functional Anatomy of Birds, Reptiles and Amphibians.

A. The osteological collection of fossil and recent birds in the National Museum of Natural History is the largest in the world. The collection is a unique resource for basic anatomical and evolutionary studies, which is consulted by systematists, anatomists, archaeologists, and game law enforcement officers in the museum, other governmental bureaus such as the Department of the Interior, and universities both in this country and abroad. Each specimen demands considerable cleaning and preparation before it is ready for study. Through support from private funds, considerable progress has been made in reducing the backlog of unprepared osteological specimens. Such private funds were not available beginning in Fiscal Year 1970. The present backlog of unprepared specimens is 5,000 with 1,000 new specimens being received yearly. A program has been developed based on the processing of 1,500 specimens per year over a 10-year period. At the end of this 10-year period the data on the collection could be currently maintained and made available to serious students and scientists generally and would expand this valuable service in support of research by a broad spectrum of the scientific community.

B. At present about one half the osteological collections of reptiles and amphibians has not been properly curated. The skeletons are lying

Program Category IB - \$1,000

0 II - \$1,000

0

0

Level of Effort Base Resources Additional Resources
in 1969 to be reallocated Requested for 1971
Man-Years Amount Man-Years Positions Amount

loose in open containers. There is urgent need to put these collections in closed skeleton boxes so that they can be used efficiently and effectively by the SI research staff and other scientists who wish to consult these collections in connection with their own studies of functional anatomy and systematics.

Program Category Ib would account for 50% or \$1,000 of the total budget; Program Category II for the other \$1,000.

Budget:
 Supplies \$1,000
 Equipment 1,000
 Total \$2,000

0
0
0
0
0

Ic Geological Studies

<u>Item</u>	<u>Positions</u>	<u>Amount</u>	<u>Page No.</u>
(1) Establishment and Staffing of a Crystallography Laboratory	1.0	166.7	100
(2) Study of Volcanic Eruption Patterns Including Development of Techniques for Predicting Courses of Volcanic Eruptions	4.0	76.4	101
(3) Systematic Basic Research on the Origin, Occurrence and Classification of Ore Deposits	3.0	38.7	103
(4) The Abyssal Astracode Program	--	5.2	106
(5) A Biological Analysis of Continental Drift	4.0	57.5	108
Total--Geological Studies	<u>12.0</u>	<u>344.5</u>	

Increases for 1972 by Project

Project Description/Priority No. 1	Level of Effort.	Base Resources	Additional Resources
	in 1970	to be reallocated	Requested for 1972
	Man-Years Amount	Man-Years Amount	Positions Amount
		.5 \$33,000	1 \$166,700

Establishment and Staffing of a Crystallography Laboratory.

The need for this new facility is given succinctly in the report of the First Advisory Committee for the Department of Mineral Sciences which states "There is real need for a structural crystallographer in most of the research of the Department... a mineralogical establishment that lacks a crystallographer in a Department blessed with such rich collections and an environment so favorable to research borders on simple waste. Little would be gained by hiring a crystallographer unless the proper equipment were obtained at the same time. A major long-range commitment for staff and a considerable allocation for equipment are clearly in order here."

This project would require 1 new position, a museum technician, GS-7. Annual cost after the first year would be only \$11,700. Inasmuch as the equipment in the amount of \$155,000 as follows would be purchased during the first year:

2 Weissenberg cameras (new X-ray generators not needed) \$4,000; automatic diffractometer with computer \$70,000; nuclear magnetic resonance basic EPR machine \$46,000; NMR unit to be used #3 \$15,000; Mossbauer equipment \$20,000.

Budget:

Personnel	\$ 8,700
Travel	500
Supplies	2,500
Equipment	<u>155,000</u>
Total	\$166,700

Program Category I o

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description/Priority No. 2</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
<u>Study of Volcanic Eruption Patterns Including Development of Techniques for Predicting Courses of Volcanic Eruptions.</u> The objectives of this project are five-fold.			.1	\$2,900	4	\$76,400

Study of Volcanic Eruption Patterns Including Development of Techniques for Predicting Courses of Volcanic Eruptions. The objectives of this project are five-fold.

1. Research and documentation of volcanic eruption patterns, including attempts to predict courses which will be followed by a given type of volcanic eruption.
2. Sampling and laboratory analyses of erupted samples.
3. Preparation of a research collection of specimens, films, and geophysical data documenting phases of volcanic eruptions.
4. Preparation, in conjunction with other groups, including the Geological Survey, of a yearly summary of the major volcanic eruptions and of their contributions to research in volcanology.
5. Studies of chemical contaminants from volcanic eruptions and of their pathological effects on plants and animals

There are between 6 and 50 volcanic eruptions each year. Of these, only about half are covered and documented by scientists. Further, there is no central repository for important

<u>Program Category</u>	<u>I</u>	<u>C</u>
	0	0
	0	0

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description/Priority No. 2

information on the scientific aspects of those eruptions which are studied and documented. In conjunction with the newly established SI Center for Short-Lived Phenomena, this program will attempt to stimulate data collections and research on all major volcanic eruptions. Under this program expeditions would be dispatched where there are compelling reasons for direct involvement. These reasons include (1) lack of local coverage, (2) unusual significance of eruptions, and (3) requests for scientific assistance in an important but only partially covered eruption.

The type and quantities of chemical contaminants from volcanic eruptions would also be measured, particularly those which have important biological effects (e.g. fluorine). Attempts would be made to do biological studies of damaged plants and animals and to identify the specific toxins and their levels.

The project would require four new positions: 1 volcanologist, GS-12; 1 chemist, GS-9; 1 museum technician, GS-5; and 1 clerk-typist, GS-3. Consultant geophysicists under contract would provide specialized abilities for short periods as required, e.i., 30 to 6 months. Extensive foreign travel by field parties would be involved, estimated at 3 expeditions a year. The first year a non-recurring expenditure of \$10,000 for field geophysical equipment such as seismograph optical pyrometer and magnetometer would be required.

Budget:

Personnel	\$38,400
Travel	10,000
Other services	18,000
Equipment	10,000
Total	<u>\$76,400</u>

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> Amount
1.00	\$14,000	3
		\$38,700

Project Description/Priority No. 3

Systematic Basic Research on the Origin Occurrence and Classification of Ore Deposits.

A. The objectives of this project are the preparation and maintenance of a research reference collection of rock and mineral "suites" from ore deposits and the classification of such deposits based on: 1. mineralogy, 2. geochemistry, 3. textures of ores and 4. associated rocks. Government agencies, academic institutions, the mining and other private industry long have looked to the National Museum of Natural History to provide basic information on ores and ore deposits. The increase and intensification of research efforts has placed new demands on our resources and have made clear our need to expand our collections and improve the related data if we are to meet these needs. Such research is dependent on basic data on the textures and mineralogy of our deposit suites. Once a mine is abandoned it usually collapses or is sealed. The mineral suites it contains are then no longer available. Because of this, representative suites from many formerly important mines are not now available, even though they would have both research and economic value. This has, in part, led the Society of Economic Geologists to point out the need for a national study on, and the preservation of, important ore suites.

Program Category

I c \$38,700 Mineral Sciences

I d \$32,000 Anthropology

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description/Priority No. 3

This function is within the charter of the National Museum of Natural History which already has a considerable collection in this area.

B. Information developed in the search for ore deposits exploited by man for millenia in areas of early development of metallurgical technology has immediate application in that it gives valuable clues to ore deposits of possible commercial significance. In the Andean regions of Peru, Ecuador and Bolivia many of the ancient mines of copper, gold silver have been lost after the Spanish Conquest of the Inca in the 16th century. However, pre-Columbian metal artifacts attest to advanced technology. Ancient tin and lead and copper deposits in the Middle and Near East have been found through archeological research and information leading to similar rediscoveries could result as a by-product of the proposed cooperative field research by geologists and archeologists. The same data and specimens to be collected on national basis in A. would be expanded on the international basis and coupled with time-depth studies.

C. Leadership of this project would be provided by current museum staff. This is an interdisciplinary project which would require 3 new positions, all to be within the Department of Mineral Sciences where laboratory study of specimens collected would be performed. The positions required would be one geologist, GS-12, and two museum technicians, GS-7. Since field research would be provided through scientific coordination and leadership of the Department of Anthropology, that phase of the project attributable to Program Category Ia would be at no cost to the Department of Mineral Sciences.

Budget	
Personnel	\$32,700
Supplies	3,000
Equipment	<u>3,000</u>
Total	\$38,700

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount
1 \$20,600

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

The Abyssal Ostracode Program. The abyssal ostracodes represent a small but important part of the living fauna and fossil record of the ocean floor. The Ostracoda, microscopic crustaceans that have been in existence for half a billion years, have responded in their evolutionary history to the major events of the formation of seas, oceans, and drifting continents. Their use is well established in mapping the formation of shallower sedimentary deposits in oil wells and oceanographic core samples. In the deep sea they are among a very few forms of present life of which fossils are known.

The importance of the proposed study of deep-ocean or abyssal ostracodes is: (1) they provide a rare opportunity to examine basic genetic isolation mechanisms in a thermally reduced environment over a long period of time--potentially arrested gene flow; (2) the recognition of ancient oceans that have been destroyed by mountain building in the formation of new continental complexes, and (3) as an instrument in refining man's ability to understand natural but severe environmental change and its long term effect on the histories of organisms.

The major effort in this country is the study of deep-sea or abyssal ostracodes and their fossil record is centered here in the Smithsonian. The National Museum of Natural History laboratory (the only one of its kind in the nation) now has specimens and sample material from many major ocean expeditions and numerous geological surveys from all over the world. The information that

Program Category
I a - \$15,400
I c - \$5,200

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Additional Resources Requested for 1972 Positions Amount

Base Resources to be reallocated Man-Years Amount

Level of Effort in 1970 Man-Years Amount

Project Description

would be made available from an analysis of this material would be of vital use to ecologists and geologists studying the history of the ocean floor and the animals that have lived on it.

This project would require 1 new position, a research assistant, GS-9. Computer and scanning electron microscope services would be needed at a cost of \$800. Publication (photo plates) would cost \$500. Equipment as follows would be required to a total of \$4,700: storage, museum case, containers \$1,200; field equipment, processing apparatus \$2,500; permanent apparatus, microscope accessories, analytical equipment \$1,000. Program Category Ia requirements would account for approximately 75% (\$15,400) of the total budget and Program Category Ic approximately 25% (\$5,200) of the budget.

Budget:	
Personnel	\$10,600
Travel	3,200
Other services	1,300
Supplies	800
Equipment	<u>4,700</u>
Total	<u>\$20,600</u>

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u> <u>Man-Years Amount</u>	<u>Base Resources to be reallocated</u> <u>Man-Years Amount</u>	<u>Additional Resources Requested for 1972</u> <u>Positions</u>	<u>Additional Resources Requested for 1972</u> <u>Amount</u>
			4	\$57,500

A Biological Analysis of Continental Drift.
 During recent years a great variety of geological, geophysical, and oceanographic data have been amassed concerning Sea Floor Spreading and Continental Drift, and this has become one of the most significant developments in modern science. Biological data have been utilized only sparsely in the studies to date, yet these data exist and should form a major source of information leading to a better understanding of what occurred in the early development of our planet. Formation of new ocean basins through Continental Drift should have had a profound effect on the biogeography and evolutionary history of marine organisms, especially those of shallow shelf areas, and these data should be completely preserved in the fossil record. The feasibility of a major biological survey of Continental Drift would be established in the model study proposed.

The best known Ocean Basin formed through Sea Floor Spreading and Continental Drift is the Atlantic Basin, opened some 200-250 million years ago and acquiring its present characteristics 35 to 50 million years ago. Fortunately, this basin also has a greater amount of fossil and recent biological data available for it than for any other area, although this has not been organized. It is proposed to make systematic biological analyses, comparisons of contemporaneous evolutionary histories, and comparisons of environmental histories of fossil molluscs, the dominant and environmentally most sensitive shelf organisms, on

<u>Program Category</u>	<u>I</u>	<u>c</u>
	0	0
	0	0
	0	0
	0	0

<u>Project Description</u>	<u>Level of Effort</u> in 1970	<u>Man-Years</u> <u>Amount</u>	<u>Base Resources</u> to be reallocated	<u>Man-Years</u> <u>Amount</u>	<u>Additional Resources</u> Requested for 1972	<u>Positions</u> <u>Amount</u>
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either side of the Atlantic Basin prior to, during, and immediately following its formation by Continental Drift (Permian-Paleogene time). These data would then be applied in the development of a large scale program to be undertaken by this country in support or contention of the hypotheses, and are expected to be of such magnitude that they will strongly effect future work in this field.

Knowledge of the history and nature of Continental Drift will be of great significance in the further discovery and utilization of important natural resources especially petroleum.

This project would require 4 new positions:

- 1 paleobiologist (specialist in Ammonites on Permo-Triassic Mollusca), GS-13; 1 EDP specialist (with biological training), GS-9, and 2 research assistants (one for new staff member and one for present staff), GS-7. Computer costs would be \$1,000; contracts for radiometric dating of samples would amount to \$5,000; and a first year cost for microscopes would be required.

Budget:

Personnel	\$46,000
Travel	2,000
Other services	6,000
Supplies	500
Equipment	3,000
Total	<u>\$57,500</u>

Id Anthropological Studies

<u>Item</u>	<u>Positions</u>	<u>Amount</u>	<u>Page No.</u>
(1) Photographic Salvage Project to Prevent Further Deterioration of Old Prints and Negatives	4.0	72.3	110
(2) Study of Disappearing Traditional Crafts, Industries, Technologies and Ancient Weaving Techniques	1.0	59.8	112
(3) Fundamental Research Program on the Study of Fossil and Recent Pollens	1.0	71.5	114
(4) Systematic Basic Research on the Origin, Occurrence and Classification of Ore Deposits	--	<u>32.0</u>	117
Total--Anthropological Studies	<u>6.0</u>	<u>235.6</u>	

Increases for 1972 by Project

Level of Effort
in 1970
Man-Years Amount

Base Resources
to be reallocated
Man-Years Amount

Additional Resources
Requested for 1972
Positions
Amount

.1 \$1,300 4 \$72,300

Project Description/Priority No.

Photographic Salvage Project to Prevent Further Deterioration of Old Prints and Negatives. The photographic collections in the National Anthropological Archives are the largest in the world relating to American Indians. This unique national documentary resource is consulted constantly by anthropologists, historians, national and international scholars, and the general public. This increase would be used to transfer to safety film the prints and negatives of pictures taken during the period from 1858 to 1928 during which time glass and nitrate negatives were used. Approximately 25,000 prints and 15,000 negatives require attention immediately if the valuable information they present is not to be lost. The deterioration, once started, progresses rapidly since the gasses given off accelerate the process.

This salvage project would be the first phase of a continuing program for the expansion and improved utilization of the photograph collections in the National Anthropological Archives. There is a continuing need for a photo finishing laboratory located adjacent to the Archives, not only to accomplish this salvage project, but to house the existing negative collection, to make negatives of an existing backlog of 25,000 photographic prints for which there are no negatives, to collect and copy additional collections and to establish an archives of anthropological color photographs and slides.

Program Category III d

This would be a three year project at the proposed level of funding and would require four new positions: 1 photographer, GS-9, 1 museum technician, GS-7; and 2 museum technicians, GS-5. Equipment required would be cases for negatives, prints, catalogs, and miscellaneous material. Construction of a photographic laboratory and operating it for three years is equivalent to the estimated cost of doing only the three-year salvage project at outside commercial rates - if it were feasible or advisable to send unique original glass and nitrate negatives outside the Smithsonian, which it is not. After the first year, it is estimated the annual cost will be about \$39,000.

Budget:

Personnel	\$33,000
Other services	35,000
Supplies	3,000
Equipment	<u>1,000</u>
Total	\$72,300

Increases for 1972 by Project

<u>Level of Efforts in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
	.2	1
	\$9,800	\$59,800

Project Description/Priority No.

Study of Disappearing Traditional Crafts, Industries, Technologies and Ancient Weaving Techniques. A. A portion of this increase would be used to expand field studies of rapidly disappearing crafts and village industries, particularly in South Asia and Africa. The report of the Anthropology Advisory Committee urged the expansion of this program while the information can still be collected and studied. This information would be made available to the Museum community and to scientists in the preparation of exhibits on or in studies of the history of technologies. In addition, the information developed would aid in meeting requests from government agencies in many of the developing countries and from others (the Ministry of Cottage Industries in Pakistan and the Ceylon Department of Cultural Affairs are examples) for assistance in reviving small industries and crafts in the manufacture of authentic folk arts and articles. Applications for the use of excess currencies would be made to cover work in those countries where such funds are available. The total of such requests would be approximately \$100,000. The program is projected for a period of five years. Funds would be required for studies in countries where excess currencies are not available.

Program Category I d

B. Studies of ancient weaving techniques found in archeological materials would be correlated with those being made of surviving traditional arts and crafts. Ancient textiles, primarily from the United States and South America, initially would be analyzed by computer techniques together with other materials from grave lots. An attempt would be made to learn more of the processes and operations some of which cannot yet be duplicated on modern looms. Textile experts are interested in these studies and the possible application to present day industrial operations. This program would be planned for a three year period at the level of funding requested.

C. One new position, a secretary, GS-6, would be required. Particular financial requirements would be: field research under contract for about \$20,000; contract for analysis desired based on price per unit analyzed about \$16,000; cluster analysis of data developed about \$8,500; computer time, \$2,500; and specialized equipment such as attachments for microscopes, mounting materials, etc., about \$2,500.

Budget:

Personnel	\$7,800
Travel	1,000
Other services	47,000
Supplies	1,500
Equipment	<u>2,500</u>
Total	\$59,800

Increases for 1972 by Project

<u>Project Description/Priority No.</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

Fundamental Research Program on the Study of Fossil and Recent Pollens. Palynology is one of the most important areas of interdisciplinary research on the evolutionary history of flowering plants. This work is needed to complement current research and provide basic data in tracing the evolutionary history of modern plants through the identification and analysis of fossil spores and pollens. The kinds of pollen found at the various strata would also provide the paleobotanists with information on the geographic distribution, relative abundance and changing nature of the plant life and, hence, the variations in climatic environment and ecological patterns. Such information would be of incalculable value not only to those interested in paleo-biology, botany and evolutionary biology but to the archeologists and ethnologists as well. Examples of the applications to current problems in these fields are: 1) Studies of development of economically useful plants, particularly of cultured species. It is important to our understanding of Pre-Columbian culture to know, for example, when Maize pollen first appears in the strata in sufficient quantity to indicate domestication. Even in areas so humid that actual preservation of pre-historic corncobs in archeological sites is not possible, critical examination of the pollen

Program Category
Ia - \$10,000
Id - \$10,000

\$20,000

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description/Priority No.

sequences has shed light on periods of expansion (or contraction) of agriculture. Often agricultural development is accompanied by evidence of plants which colonized cleared fields which are lying fallow. Studies of this type would add a great deal to our understanding of (a) domestication of plants and (b) changes in the vegetational cover which accompanied long-term land clearance. 2) In highland Peru domestication of plants and animals began thousands of years ago, preceding the high development of cultures. Some theories have related the high civilization development in the New World to corn alone. There is doubt that this is correct. The resolution of this question will have considerable bearing on our studies of the development of civilization in the New World. Only by pollen studies in those climates where all remains except pollen have been destroyed can this be proven. Also information would also be important in reconstructing the previous climate of the area and its botanical history. 3) Savannas (or grasslands) in the New World have often been attributed to man. In many cases it appears they are of greater age. Where the original forest cover is gone only the fossil pollen record can provide the clue to this information which is essential to correct interpretations of the subsistence means of Pre-European man in parts of the Western Hemisphere.

This would be a long term program funded at a cost of \$32,900 annually. However, this is an interdisciplinary project of which the cost to the Department of Anthropology would be \$20,000 annually for a contractual consultant, \$10,000 of which would be required for Program Category Ia and \$10,000 of which would be required for Program Category Id.

Budget	
Other services	\$20,000
Total	<u>\$20,000</u>

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> <u>Amount</u>
1.00	\$14,000	\$32,000

Project Description/Priority No. 3

Systematic Basic Research on the Origin Occurrence and Classification of Ore Deposits. A. The objectives of this project are the preparation and maintenance of a research reference collection of rock and mineral "suites" from ore deposits and the classification of such deposits based on: 1. mineralogy, 2. geochemistry, 3. textures of ores and 4. associated rocks. Government agencies, academic institutions, the mining and other private industry long have looked to the National Museum of Natural History to provide basic information on ores and ore deposits. The increase and intensification of research efforts has placed new demands on our resources and have made clear our need to expand our collections and improve the related data if we are to meet these needs. Such research is dependent on basic data on the textures and mineralogy of our deposit suites. Once a mine is abandoned it usually collapses or is sealed. The mineral suites it contains are then no longer available. Because of this, representative suites from many formerly important mines are not now available, even though they would have both research and economic value. This has, in part, led the Society of Economic Geologists to point out the need for a national study on, and the preservation of, important ore suites.

Program Category I c \$38,700 Mineral Sciences
 I d \$32,000 Anthropology

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0
0

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description/Priority No. 3

This function is within the charter of the National Museum of Natural History which already has a considerable collection in this area.

B. Information developed in the search for ore deposits exploited by man for millennia in areas of early development of metallurgical technology has immediate application in that it gives valuable clues to ore deposits of possible commercial significance. In the Andean regions of Peru, Ecuador and Bolivia many of the ancient mines of copper, gold silver have been lost after the Spanish Conquest of the Inca in the 16th century. However, pre-Columbian metal artifacts attest to advanced technology. Ancient tin and lead and copper deposits in the Middle and Near East have been found through archeological research and information leading to similar rediscoveries could result as a by-product of the proposed cooperative field research by geologists and archeologists. The same data and specimens to be collected on national basis in A. would be expanded on the international basis and coupled with time-depth studies.

0
0
3
3
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C. Leadership of this project would be provided by current museum staff. This is an interdisciplinary project which would require no new positions for the Department of Anthropology. Laboratory study of specimens would be performed by the Department of Mineral Sciences; field research would be provided through scientific coordination and leadership of the Department of Anthropology at a cost of \$32,000 the first year and \$26,000 annually for the next 3 years since the vehicle would serve for future field seasons. This phase of the project would entail only funds for field research, maintenance, and field supplies. It is anticipated that contract work for field teams would be about \$15,000 annually.

Budget:	
Other services	\$25,000
Supplies	1,000
Equipment	<u>6,000</u>
Total	\$32,000

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description/Priority No.

sequences has shed light on periods of expansion (or contraction) of agriculture. Often agricultural development is accompanied by evidence of plants which colonized cleared fields which are lying fallow. Studies of this type would add a great deal to our understanding of (a) domestication of plants and (b) changes in the vegetational cover which accompanied long-term land clearance. 2) In highland Peru domestication of plants and animals began thousands of years ago, preceding the high development of cultures. Some theories have related the high civilization development in the New World to corn alone. There is doubt that this is correct. The resolution of this question will have considerable bearing on our studies of the development of civilization in the New World. Only by pollen studies in those climates where all remains except pollen have been destroyed can this be proven. Also information would also be important in reconstructing the previous climate of the area and its botanical history. 3) Savannas (or grasslands) in the New World have often been attributed to man. In many cases it appears they are of greater age. Where the original forest cover is gone only the fossil pollen record can provide the clue to this information which is essential to correct interpretations of the subsistence means of Pre-European man in parts of the Western Hemisphere.

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This would be a long term program funded at a level of \$32,900 annually. Two new positions (a botanist, GS-13, and a museum technician, GS-7) would be required. Construction of laboratory facilities and modification of existing rooms would require \$15,000; initial equipping of the laboratory would be \$75,000. All costs would be borne by the two program categories involved on a 50-50 basis, i.e., cost to Program Category Ia would be \$61,400 and to Program Category Id \$61,500.

Budget:

Personnel	\$ 26,700
Travel	2,000
Other services	15,000
Supplies	1,200
Equipment	<u>78,000</u>
Total	\$122,900

II. Reference Systems Management

<u>Item</u>	<u>Positions</u>	<u>Amount</u>	<u>Page No.</u>
(1) Expansion of Studies of the Vegetation of Dominica	1.0	12.2	120
(2) Collection-Related Computer Activities: Herbarium Transactions	1.0	8.0	122
(3) Collection-Related Computer Activities: Type Specimen Register	7.0	100.4	124
(4) Application of Computer Techniques to the Classification of Ferns	2.0	15.5	126
(5) Investigation of the Biological Inter-relationships of Plant Feeding Insects	0.3	7.3	127
(6) Expanded Studies of Pollinating Insects and their Relationships to Increasing Crop Yields	0.3	5.4	129
(7) Studies on the Increasing use of Biological Control Agents in lieu of Pesticides	0.4	5.6	131
(8) Study of the Role of Soil Arthropods in the Food Chain and as Indispensable Agents of Conversion of Organic Debris	0.5	7.0	133
(9) Studies of Aquatic Insects and their Role in the Food Chain and as Pollution Indicators	<u>0.5</u>	<u>7.1</u>	135
Subtotal--5-9	2.0	32.4	

Continuation of II--Page 2

<u>Item</u>	<u>Positions</u>	<u>Amount</u>	<u>Page No.</u>
(10) Research in Collection Management	7.0	55.9	137
(11) Technician Training Program	2.0	6.8	138
(12) Establishment of Protozoology Reference Collection	1.0	14.7	139
(13) Data Automation for Zoology Reference Collections	2.0	27.3	140
(14) Improvement of Ore Collection Data Management	3.0	45.6	141
(15) Establishment of Scientific Center on Volcanic Activity	1.0	9.0	143
(16) Increasing Economic and Scientific Utilization of Paleobiological Data through a Computer Retrieval System	4.0	42.5	144
(17) Systematic and Ecological Studies of Marine Birds	0.7	9.4	145
(18) Increasing the Accessibility and Scope of Data on Birds and Mammals in the National Collections	6.0	68.8	147
(19) Development of National Marine Mammal Study Center	3.6	52.9	150
(20) Endangered Freshwater Fishes of South America: Systematic, Ecological and Biogeographic Research	0.7	10.5	153
(21) Comparative Faunistic Inventory of Indo-Pacific Coral Reef Fishes	0.7	11.0	156

Continuation of II--Page 3

<u>Items</u>	<u>Positions</u>	<u>Amount</u>	<u>Page No.</u>
(22) Systematic and Ecological Research on Tropical Birds and Mammals	0.7	14.4	158
(23) Systematic Research on Freshwater Amphibians and Reptiles	- -	1.3	162
(24) Systematic Research on Sharks and Rays	0.6	11.6	163
(25) Basic Research on the Functional Anatomy of Birds, Reptiles and Amphibians	- -	<u>1.0</u>	165
Subtotal--17-25	<u>13.0</u>	<u>180.9</u>	
Total--Reference Systems Management	<u>46.0</u>	<u>551.2</u>	

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
					2	\$25,700

Expansion of Studies of the Vegetation of Dominica. A floristic study of the vegetation of Dominica, a tropical, forested island in the West Indies, has been underway as an official Smithsonian project since 1964. The goal is completion of a systematic publication on the dicotyledonous plants. There is no comparable earlier coverage for this island. The project is urgent in the face of logging operations which are rapidly changing the island.

Revisory works in Araceae are needed to complete knowledge of this family which, in addition to broadening botanical knowledge generally, is an important and taxonomically difficult element in tropical forest vegetation, and also important economically as a source of human food starch and for garden ornamentation.

One research assistant, GS-9, will be needed during the completion of the study, and a museum technician, GS-7, plus an increase for computer services required to continue the present computer management of transactions and provide more and better specimen data to the scientific community. Phase I, which falls into Program Category Ib, will require financial support of \$13,500; Phase II, which falls into Program Category II, will require \$12,200.

Program Category I b \$13,500
II \$12,200

Budget:	
Personnel	\$19,300
Travel	1,500
Other services	3,400
Supplies	700
Equipment	<u>800</u>
Total	\$25,700

Increases for 1972 by Project

Level of Effort in 1970	Man-Years Amount	Base Resources to be reallocated	Additional Resources	
			Man-Years Amount	Positions Amount

7 \$100,400

Project Description

Collection-Related Computer Activities: Type Specimen Register. Of the more than 3 million specimens in the U.S. National Herbarium, some 60,000 are type specimens, which have been segregated from the General herbarium as a special collection. These types constitute the most important specimens (vouchers) of the entire herbarium, and they are being used constantly by taxonomists from all over the world. An associated card file gives basic information for each type specimen, including a citation of the publication where this type specimen was first described. This invaluable file, which has been created over many years by Smithsonian botanists, is ideal for computer entry. When computerization is complete it will be of use within the Smithsonian in meeting the immediate and growing need of scientists for these data, and copies of the computer tapes can be sent to other institutions for their use. Conversion of the card file to computer-readable form was begun in 1968 by the Department of Botany. Since then computer printouts of the growing file have been periodically distributed, and the New York Botanical Garden and the Missouri Botanical Garden have cooperated with the Smithsonian by adding data from their own type collections for ultimate entry into the computer system. As the system is developed and as the computerized file grows other institutions will cooperate in the network. The goal is a unified or computerized catalog of type holdings in all the major herbaria of North America. At the present rate of data input about 15,000 cards (i.e. about one-fourth of the total file) will have been entered by.

Program Category: II

FY 1972. This pace should be accelerated in order to quickly complete the entry of the Smithsonian file as a base upon which to build the larger system.

On the basis of converting about 25,000 records a year to the data processing system, the Type Specimen Register would be completed by the end of FY 1973. Seven new positions would be required: 1 botanist, GS-12, to perform as administrator and chief editor; 1 editor, GS-9; 1 editor, GS-7; 3 machine operators at GS-5 level; and 1 programmer, GS-12. Computer rental (processing and retrieval services) would be required as well as a computer system for source data automation with two terminals. The three machine operators are required to keep two terminals running full time. These operators will be trained in data preparation.

Budget:	
Personnel:	\$ 70,900
Travel	1,000
Other services	27,500
Supplies	400
Equipment	600
Total	<u>\$100,400</u>

Increases for 1972 by Project

Project Description	Level of Effort in 1970		Base Resources to be reallocated		Additional Resources Requested for 1972	
	Man-Years	Amount	Man-Years	Amount	Positions	Amount
Collection-Related Computer Activities:					1	\$8,000

Collection-Related Computer Activities:
Herbarium Transactions. The U.S. National Herbarium, maintained and managed by the Department of Botany, comprises over three million plant specimens. It is one of the three largest herbarium collections in the western hemisphere and one of the 10 largest in the world. In recent years, about one per cent of the collection has circulated on loan to other institutions each year for scientific study, and an average of 70,000 specimens/year have been received as exchange. Because managing this huge collection by conventional means becomes more difficult every year as it grows even larger, the Department has begun on a modest scale to modernize its transaction and information-retrieval procedures by introducing computer methods.

All loan and exchange transactions are punched on IBM cards, and regular status reports are printed from the computer. These are used by the Herbarium Services Unit to control the transactions and maintain the necessary records. Steps are under way also to develop better control over the nomenclature used in the Herbarium. A machine-readable file of all generic names in the Herbarium has been created and now is undergoing editing. The file must be edited so that it can be updated regularly and can be used to generate current family indices to increase the usefulness of the Herbarium to those scientists who have need for the data it contains.

Program Category II

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<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
<u>Amount</u>	<u>Amount</u>	<u>Amount</u>

Project Description

Following is an estimate of the budget that the Herbarium Services Unit will need in FY 1972. To continue the present computer management of transactions and to provide more and better data concerning the specimens to the scientific community more quickly one new position, one new position (a museum technician, GS-7, one-half time) and an increase in computer time are required.

Budget:

Personnel	\$4,300
Other services	3,400
Supplies	300
Total	<u>\$8,000</u>

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NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount
2 \$15,500

Bases Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Descriptions

Application of Computer Techniques to the Classification of Ferns. Traditional methods of classification have failed to solve problems of generic delimitation in ferns. Contrary to most groups of ferns, many of the genera of the Adiantoidae resemble one another because of extensive convergent and parallel evolution in the group. Therefore, a successful taxonomy of this difficult and unusual group depends upon a character-by-character analysis--and this requires computerization. This study would refine and extend work begun on a non-traditional taxonomic method and on its very powerful computer analogue, which will have application to many other groups of organisms. At present, the computer programs are not as efficient or as generalized as they could be. They need to be brought forward to the current state of the art in taxometrics and computer science. Additional computer time as well as the services of a programmer, GS-9, one-half time, and a research assistant, GS-7, would be required.

Program Category II

Budget: Personnel \$14,000
 Other services 1,500
 Total \$15,500

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
	0.6	\$8,500	I \$22,900
	1.1	\$11,200	

Investigation of the biological inter-relationships of plant feeding insects.

Studies of plant feeding insects have in recent years provided much basic biological knowledge of such natural phenomena as host specificity, host transferability, isolating mechanisms and polymorphism. In addition, considerable information regarding the systematic relationship of the host plants can be acquired through a careful study of their associated insect pests. Numerous species of herbivorous insects are serious pests of agricultural crops and ornamental plants. In the United States alone, destruction caused by these pests amounts to more than two billion dollars each year. Without the various means of chemical control now utilized, the estimated losses would soar considerably higher. As chemical control for these pests is reduced to lessen environmental pollution, biological control programs must be discovered or improved. Consequently, there exists an urgent need by scientists seeking to develop these controls, for basic biological knowledge of all important insect pests.

Program Category I a - \$8,000

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Ib - \$7,600
II. - \$7,300

This project would require one new position, a research assistant, GS-7. Costs for equipment would be broken down as follows: binocular microscope, \$1,500; library and office equipment, \$1,000; camera equipment, \$1,500; insect cases and drawers, \$4,200; miscellaneous equipment, \$1,500. *

Budget:

Personnel	\$ 8,700
Travel	3,000
Supplies	1,500
Equipment	9,700
Total	<u>\$22,900</u>

*Of the total budget, Program Category Ia will account for approximately 35% or \$8,000; Program Category Ib for 33% or \$7,600; and Program Category II for 32% or \$7,300.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years Amount</u>		<u>Man-Years Amount</u>		<u>Positions</u>	<u>Amount</u>
Expanded Studies of Pollinating Insects and Their Relationship to Increasing Crop Yields.	0.4	\$5,600.	0.6	\$6,100	2	\$38,400

The present limited program on behavior, intra-floral relationships and systematics of pollinating insects has resulted in the discovery of the very important and unique role played by certain solitary North and South American bees in the pollination of the squashes and gourds native to the Americas. As a result of the current studies, plans are being made now for the importation and liberation of certain of the American bees into Hawaii and developing countries where the American squashes and gourds are already being cultivated. It is anticipated that this will result in substantially increased crop yields in Hawaii and other countries where bees native to those areas are not effective pollinators. The expansion of studies on pollinating insects is required to provide additional basic data to scientists involved in studies designed to meet the very urgent need for improvement of crop yield due to the ever-burgeoning world population.

Program Category I a - \$21,100

Ib - \$11,900

II - \$5,400

The major requirements for carrying out studies under this project are additional personnel (one entomologist (specialist in Diptera), GS-12, and one research assistant, GS-7) and \$11,200 worth of equipment (binocular microscopes, \$2,500; library, office, and laboratory furniture, \$1,500; camera equipment, \$2,500; insect cases and drawers, \$4,200; and miscellaneous equipment, \$500). Of the total fiscal year 1972 budget, Program Category Ia will account for approximately 55% or \$21,000; Program Category Ib for 31% or \$11,900; and Program Category II for 14% or \$5,400. The annual cost of this proposed expansion in subsequent fiscal years would be \$25,500.

Budget for FY 1972:

Personnel	\$24,000
Travel	2,600
Supplies	600
Equipment	<u>11,200</u>
Total	\$38,400

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
Studies on the increasing use of biological control agents in lieu of pesticides.	0.3	\$5,300	0.6	\$16,100	3	\$46,200

Studies on the increasing use of biological control agents in lieu of pesticides.

Results achieved so far in this important but minuscule program have demonstrated the substantial possibility of predaceous solitary wasps serving as important agents in the control of insects of economic importance. These wasps prey upon caterpillars, aphids, spiders and other arthropods in tremendous numbers as food for their young. Just one female wasp will use as many as 600 spiders or 250 caterpillars in the brood cells which she will provision. Many of the species preyed upon are important as pests of vegetation, acting as defoliators, leaf miners or sapsuckers, so that the wasps serve as effective biological control agents. Our present urgent concern to lessen environmental pollution now being caused by insecticides and other chemical control methods by substitution of biological agents makes it essential that the expansion of present studies on predaceous and parasitic insects be given increased emphasis immediately. Studies would also be initiated on predaceous beetles, another insect group of major importance as biological control agents.

Program Category I # - \$27,700

I b - \$12,900

II - \$5,600

Additional staffing and equipment resources needed for carrying out this project are: 3 new positions (1 entomologist, GS-12; 1 research assistant, GS-7; and 1 secretary, GS-6) and \$11,200 worth of equipment (microscopes, \$2,500; office, library, and laboratory furniture, \$1,500; camera equipment, \$2,500; insect cases, \$1,000; insect drawers, \$3,200; and miscellaneous equipment, \$500). *

Budget:	
Personnel	\$31,800
Travel	2,600
Supplies	600
Equipment	<u>11,200</u>
Total	\$46,200

*Of the total budget, Program Category Ia will account for approximately 60% or \$27,700; Program Category Ib for 28% or \$12,900; and Program Category II for 12% or \$5,600.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
Study of the role of soil arthropods in the food chain and as indispensable agents of conversion of organic debris.	0	0	1.0	\$10,200	6	\$87,300

Arthropods are one of the most abundant constituents of the soil fauna and flora. Rich soils may harbor more than 10 million arthropods per acre. These animals are very important elements in the food chain of higher organisms. Some are indispensable in conversion of organic debris, thus maintaining the productivity of our environment. Others are important as parasites or predators of other soil animals. Many of them are very sensitive to insecticides and herbicides, thus serving as indicators of soil pollution. Despite their abundance, virtually nothing is known concerning the identity or behavior of these arthropods.

Because of our national priorities in increasing productivity and reducing environmental pollution, there is an urgent need to give increased attention to the studies on these very important components of the soil biota. In order to carry out this project, six new positions will be needed, among them 2 entomologists, GS-12, supported by 1 illustrator (GS-7), 1 research assistant (GS-7), 1 secretary (GS-6), and 1 field technician (GS-5). One entomologist will work on the apterygote insects

Program Category I a - \$45,400
 I b - \$34,900
 II - \$7,000

(silverfish, springtails, and allies) and the other on the arachnids (mites, spiders, and ticks). Necessary equipment would be microscopes, \$6,700; insect cases, \$2,000; library, office, and laboratory furniture, \$6,600; Mettler balance, \$700; and miscellaneous equipment, \$600. *

Budget:	
Personnel	\$62,800
Travel	4,200
Supplies	3,700
Equipment	<u>16,600</u>
Total	\$87,300

* Of the total budget, Program Category Ia will account for approximately 52% or \$45,400; Program Category Ib for 40% or \$34,900; and Program Category II for 8% or \$7,000.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
Study of Aquatic Insects and their role in the food chain and as pollution indicators.	0.7	\$11,100	1.2	\$12,400	4	\$59,200

The present program on aquatic insects occurring in freshwater environments would be expanded by the initiation of studies on aquatic Diptera. Larvae of insects belonging to this order occur in tremendous numbers in freshwater habitats. They are extremely sensitive to all kinds of pollution in their larval habitats so that their presence or absence in a given water source is an indication whether pollution has occurred. Also, because of their abundance, both the larvae and adults of these insects are extremely important elements in the food chain in aquatic habitats. The present national priorities on environmental pollution make it imperative that we augment our present program on aquatic insects now in order to provide basic information to other federal agencies and to other organizations in this country and in the developing countries where this kind of expertise is not available.

In order to expand this program, four new positions will be required as follows:

<u>Program Category I a</u>	- \$34,300
I b	- \$17,800
II	- \$7,100

1 entomologist (specialist on aquatic Diptera), GS-12; an illustrator, GS-7; a research assistant, GS-7; and a secretary, GS-6. The illustrator will assist the entire group working on aquatic insects. Equipment requirements will be binocular microscopes, \$3,500; electric typewriter, \$500; office and laboratory furniture and library, \$5,500; insect cases and drawers, \$4,200; and miscellaneous equipment, \$500. *

Budget:	
Personnel	\$40,500
Travel	2,400
Supplies	2,100
Equipment	<u>18,700</u>
	Total
	\$59,200

* Of the total budget, Program Category Ia will account for approximately 58% or \$34,300; Program Category Ib for 30% or \$17,800; and Program Category II for 12% or \$7,100.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources Requested for 1972 Positions	7	\$55,900
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Base Resources to be reallocated Man-Years	Amount
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Level of Effort in 1970 Man-Years	Amount
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Project Description

Research in Collection Management. This program would utilize an experimental approach in collection management to develop a plan for the most efficient use of curatorial staff in natural history museums and to develop and evaluate new techniques in training, personnel use, and methods of handling objects and data associated with them. The ultimate aim is the development of a manual or handbook on collection management, updating current techniques would also be developed. Aspects of training biotechnicians and record-keeping will be emphasized. Modern collection management requires the use of new techniques; in most museums collections are handled in traditional ways, for few museums have the support necessary to develop and use innovative techniques. The manual on museum management techniques is badly needed by most if not all of the 3,000 or more museums in this country.

Program Category II

This project will require seven new positions:
1 administrative assistant, GS-7; 2 museum technicians, GS-5; 3 museum aides, GS-4; and 1 clerk-typist, GS-4.

Budget:	
Personnel	\$47,900
Supplies	3,000
Equipment	<u>5,000</u>
Total	\$55,900

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
		2
		\$6,800

Project Description

Technician Training Program. Funds are requested to establish an experimental technician training program in cooperation with one or two local universities (American University and Northern Virginia Community College) in which applicants would receive on the job training as museum technicians while enrolled in school. Initially, two trainees will be enrolled to develop the program in the Department of Invertebrate Zoology. A conference held at the Washington Technical Institute in Spring 1970 established the need for well trained biotechnicians in all fields in academic institutions, government offices and museums.

This project will require two new positions (museum technicians, GS-4), but since they will be part-time positions, the cost will be as for one position only.

Budget:

Personnel	\$5,900
Supplies	300
Equipment	200
Total	<u>\$6,800</u>

Program Category II

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NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

1 \$14,700

Establishment of Protozoology Reference Collection.
Protozoans are known to be important environmental indicators. At the present time there is no central repository for permanent collections of preserved study material of protozoans in this country. Development and maintenance of national reference collections of invertebrate animals other than insects is one of the primary responsibilities of this department, and at the present time we cannot house, maintain, and make available preserved materials of free-living protozoans. An important collection of types of protozoans will be deposited with us in 1970 at no cost to the museum, and funds are required in order to house, maintain and make this collection available to the scientific community.

This project will require 1 new position, a museum technician, GS-7, in addition to \$5,000 worth of slide storage units and miscellaneous supplies and equipment in the amount of \$1,000.

Budget:

Personnel	\$8,700
Supplies	500
Equipment	500
Total	\$14,700

Program Category **II**

Increases for 1972 by Project

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
		2 \$27,300

Project Description

Data Automation for Zoology Reference Collections. In previous years data relating to selected collections of invertebrate organisms have successfully been processed by computer. The advantages of doing this stem from the fact that, through use of the computer, specimens in the collection can be accessed by any one or any combination of recorded attributes thus making it possible to answer detailed scientific questions not answerable using conventional data filing methods. In addition, the records created can be duplicated for the use of individual scientists who can then embellish the file with other data for research purposes. It is proposed that information from the sponge and mollusk collections and from selected zoological echinoderms be added to the developing zoological data base. The ultimate value of computerizing the collection records for these animal groups lies in the possibilities which it offers for a better understanding of the interrelationships among the animals and between the animals and their environment. The immediate task is to record the basic data upon which science can eventually build an enlarged understanding of life.

This project will require two additional positions: 1 museum technician, GS-5, and 1 clerk-typist, GS-4. Cataloging equipment in the amount of \$8,000 and computer time for \$5,000 will also be needed.

Budget:

Personnel	\$13,300
Other services	5,000
Supplies	1,000
Equipment	<u>8,000</u>
Total	<u>\$27,300</u>

Program Category II

9 9 59 3 6 0

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>
3			\$45,600

Project Description

Improvement of Ore Collection Data Management.
The National Museum of Natural History houses one of the most complete and potentially one of the most economically important collections of ore-bearing rocks in the world. The value of this collection, which contains about 45,000 specimens, lies in its usefulness to industrial, academic and governmental resource geologists. In order to realize its full potential it will be necessary to place all pertinent physical, chemical, and geographic data about the specimens into a computer-based storage and retrieval system.

The data in the system would be accessible in a manner which would permit geologists to obtain the answers to highly sophisticated questions which just could not be handled by any manual system of data management. For example, the geographic distribution of ores, combinations of ores, or percentages of chemical constituents in ores could be plotted for use in exploration geology. Analysis of laboratory data on the mineral and chemical constituents of ores could lead to discoveries about ore genesis, emplacement and concentration which might be useful in exploration. And in the area of industry and public service, the system would make possible faster and more accurate identification, and would yield more complete information about unknown specimens.

A particular use for ore data, of great interest to archeologists, lies in the discovery of the points of origin of ores used to make metal.

Program Category

II

Level of Effort
in 1970
Man-Years Amount

Base Resources
to be reallocated
Man-Years Amount

Additional Resources
Requested for 1972
Positions
Amount

Project Description

artifacts. Analysis of the metals in the artifacts will yield information on the type of ore used. Reference to the ore collection data bank will help to isolate the geographic area from which the ore came. Knowing the point of origin, much can be learned about trade routes, migration patterns, and levels of metallurgical technology of various metal-working civilizations.

To make the data on ore collections accessible, three new positions (a geologist, GS-13; a museum specialist, GS-5; and a museum technician, GS-5) will be needed in addition to computer services for \$4,000 and a Flexowriter for \$6,000.

Budget:

Personnel	\$35,600
Other services	4,000
Equipment	<u>6,000</u>
Total	\$45,600

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NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u> <u>Man-Years Amount</u>	<u>Base Resources to be reallocated</u> <u>Man-Years Amount</u>	<u>Additional Resources Requested for 1972</u> <u>Positions</u>	<u>Additional Resources Requested for 1972</u> <u>Amount</u>
1			1	\$9,000

Establishment of Scientific Center on Volcanic Activity. Over the past three years scientists at the National Museum of Natural History have been recording data on volcanic activity from all over the world. These data are sent in by hundreds of different scientists and observers, in the form of letters, news clippings, telegrams, movies and slides, published papers, and telephone calls. At present, about two reports per day are received, and this figure is expected to increase. The file is currently used chiefly for research and to answer some questions on volcanic activity. It is maintained on a time-space-available basis. Use of the computer to augment these efforts would make the file much more quickly accessible to those who need to respond to volcanic emergencies, and to those scientists in many institutions who are studying and observing volcanoes. The data in the file can be of value in analyzing the past performance of specific volcanoes for the purpose of predicting volcanic behavior when an eruption does occur.

Scientific expertise will be provided by current professional staff; however, one new support position, a GS-5 museum technician, will be needed. The project will also require computer costs and services in the amount of \$2,000.

Budget:

Personnel	\$7,000
Other services	2,000
Total	\$9,000

Program Category II.

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970
 Man-Years Amount

Base Resources to be reallocated
 Man-Years Amount

Additional Resources Requested for 1972
 Positions Amount

4 \$42,500

Project Description

Increasing Economic and Scientific Utilization of Paleobiological Data Through a Computer Retrieval System. One of the outstanding national resources housed in the National Museum of Natural History is the collection of fossil organisms. This collection, containing representatives of all the major groups of plants and animals which have ever existed on Earth, is important as an irreplaceable chronology of life and also as a powerful tool for the location and understanding of natural resources. This is so because all organisms are related to their physical environment as are many kinds of resources needed by man, such as oil, gas, coal, phosphates and sulfur. Three of the most important ancient life forms in the collections are the brachiopods, trilobites, and bryozoa. At present these collections are poorly organized making impossible their full utilization by geologists and biologists in industry, universities and governmental agencies. In order to efficiently use these collections and the data associated with them, it is necessary to commit the data to a computer based storage and retrieval system. This work must be begun before full use can be made of the potential which the collections offer. It is proposed in FY 1972 to begin the work of data preparation and computer entry for the Brachiopod, Trilobite, and Bryozoan collections.

This project would require 4 new positions: 1 paleontologist (specialist in Trilobites), GS-13, and 3 museum technicians, GS-5. Computer time in the amount of \$3,500 would also be required.

Budget:
 Personnel \$39,000
 Other services 3,500
 Total \$42,500

Program Category II

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u>		<u>Base Resources to be reallocated</u>		<u>Additional Resources Requested for 1972</u>	
	<u>Man-Years</u>	<u>Amount</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>	<u>Amount</u>
					1	\$11,700

Systematic and Ecological Studies of Marine Birds. Information on the systematics, distribution, behavior, and abundance of seabirds is necessary to plan for their conservation, management, exploitation and, when necessary, their control. Because of their conspicuousness, seabirds are important environmental indicators of oceanic conditions. Some species associate with discrete water masses, others are used by fishermen to locate schools of commercially exploitable fishes. Carnivorous seabirds are sensitive to pesticide contamination. Seabirds are also either directly exploitable or cause damage. Some species serve as human food and the guano of colonial species is valuable as fertilizer. Scavenger species are important in biological recycling of nutrients but their gregarious habits make them a hazard near airports.

The museum has unique seabird data resources in its large collections and field notebooks particularly those collected during three major expeditions in the central Pacific Ocean 65, 50, and 5 years ago. Other important collections are from Alaska, North Atlantic Ocean, Caribbean Sea and Antarctica. These museum collections and marine birds are being studied more intensively as their role in the biology of the seas is becoming better understood. Information is sought from the museum by other Government agencies such as the Departments of Defense, Interior, and National Institutes of Health, as well as by scientists and graduate students in universities and conservation agencies.

<u>Program Category</u>	<u>I a -</u>	<u>\$2,300</u>
	<u>II -</u>	<u>\$9,400</u>

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<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

The development of information on Pacific Ocean birds and care of the specimens from that area was supported by funds from other agencies and institutions during the years 1962-1970.

In order to maintain and make available for study the museum's large collections of seabirds whose research value has been greatly enhanced by the placing of the data associated with them in a computer system, it is necessary to provide for one new curatorial position, a museum technician, GS-7. Computer time in the amount of \$1,000 will also be required. Of the total budget for this project, approximately 20%, \$2,300, will be accounted for under Program Category Ia, and 80%, \$9,400, under Program Category II.

Budget:

Personnel	\$ 8,700
Other services	1,000
Supplies	1,000
Equipment	<u>1,000</u>
Total	\$11,700

<u>Project Description</u>	<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
	<u>Amount</u>	<u>Amount</u>	<u>Amount</u>

Data on primate specimens already in the Museum would be entered to support current systematic and ecological studies by museum staff, public health studies at NIH and the endangered species studies by the Department of the Interior.

Data on recently collected reptiles and amphibians would be captured as the specimens are received and automation of a badly needed complete geographic cross reference system would be started.

Data on selected groups of fresh water amphibians and reptiles would be entered to facilitate the program of systematic research of these animals.

Information on the extensive collection of North American fresh water fishes in the Museum would be captured to meet the needs of urgent studies on historical changes in faunal composition, habitat preferences of species, the effects of environmental change and basic systematics.

Information on selected families of coral reef fishes would also be entered in the data system in support of the program on Coral Reef studies.

The expertise and experience in data handling gained from each of these projects will be freely interchanged. Similarly the resources needed to fulfill the stated objectives would be distributed from a common pool as needed to reduce cost and increase efficiency. All of these efforts are aimed at the eventual creation of a completely

<u>Project Description</u>	<u>Level of Effort in 1970 Man-Years Amount</u>	<u>Base Resources to be reallocated Man-Years Amount</u>	<u>Additional Resources Requested for 1972 Positions Amount</u>
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automated data bank on vertebrate specimens which would be responsive to a much wider variety of questions than can be answered from the currently existing data files.

In order to capture and record the substantial amounts of data required concerning vertebrate animals, 6 new positions will be required: 4 museum technicians, GS-7, and 2 clerk-typists, GS-5. Computer time in the amount of \$10,000 will also be needed.

Budget:

Personnel	\$48,800
Other services	10,000
Equipment	<u>10,000</u>
Total	<u>\$68,800</u>

Increases for 1972 by Project

Additional Resources
Requested for 1972
Positions Amount

Base Resources
to be reallocated
Man-Years Amount

Level of Effort
in 1970
Man-Years Amount

Project Description

6 \$88,100

Development of National Marine Mammal Study Center.
Since the dawn of civilization man has utilized marine mammals as a source of food and other products. Porpoises, dolphins, whales, and seals are now becoming increasingly valuable in providing basic information essential to man's exploration and occupation of the oceans and the sea floor. The study of their physiological mechanisms, particularly their deep diving adaptations, astonishingly discriminant sonar, and their ability to communicate through water, will provide clues to new techniques for ocean exploitation.

If we are to develop their potential as monitors of pollution of the marine environment, and continue to use them as a source of food, high grade oils, furs, and other products, we must immediately make marine mammals the subject of intensive research. We must be able to identify them more precisely and to learn their systematic relationships, where they occur and why, what schedules they follow in their movements, and their social structure and behavioral patterns. It is vital that we also learn how these mammals have adapted to survive in an environment that man finds hostile, and the evolutionary steps they went through in achieving these adaptations.

To the discredit of man, the exploitation of marine mammals has been mostly heedless of biological realities, so that one population after another has been depleted or exterminated. Today these animals face even greater dangers from pollution of their environment and destruction of their food sources. The world may lose these valuable animals before we discover their full potential or know enough about them to protect them.

Program Category
I a- \$17,600
 b- \$17,600
II - \$52,900

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description

Marine mammals are poorly known chiefly because the costs of studies of them in the field and in the museum are too great for institutions such as universities and small museums to bear. A center with facilities and staff to pursue an effective research program leading to a fuller understanding of these animals is clearly needed. Faced with these needs American scientists such as those of the Woods Hole Oceanographic Institution, Johns Hopkins University and the Oceanic Institute in Hawaii have banded together to urge the Smithsonian to give leadership to the development of such a facility.

From 1878 to 1962 the National Museum developed the world's largest and most comprehensive collections of fossil and recent marine mammals, the finest library pertaining to them, and a staff of scientists with international recognition as leaders in marine mammal systematics and conservation.

Now in response to the urgent need of American scientists, the Museum is again accepting specimens for processing and storage, using inadequate equipment and temporary reassignment of technicians. In these times when marine mammals and their environment are the objects of national concern it is important that the potential of the Smithsonian in this area be fully utilized. The Institution must enhance its research competence and international leadership in marine mammalogy through field and laboratory research in ecology and natural history, systematics and evolution, and anatomy and adaptation. This would facilitate studies of marine mammals by the scientific community by making available its preparation, storage, and study areas and data bank.

<u>Level of Effort in 1970</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Base Resources to be reallocated</u>	<u>Man-Years</u>	<u>Amount</u>	<u>Additional Resources Requested for 1972</u>	<u>Positions</u>	<u>Amount</u>
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Project Description

The first year's budget will permit funds for staffing (six new positions: 1 paleontologist, GS-13; 1 neontologist, GS-13; 3 museum technicians, GS-7; and 1 clerk-typist, GS-5) and for developing modular facilities in anticipation of the move of the Marine Mammal Study Center to permanent quarters in a subsequent year. Equipment required will be modular shelving, cases, and deep freeze. Costs for computer time is expected to be about \$3,000. The budget will increase to about \$100,000 per annum when the research program is fully developed and the center is housed in permanent quarters. Allocations from budget costs for the first year will be: Program Category Ia, a approximately 20%, \$17,600; Program Category Ib, approximately 20%, \$17,600; and Program Category II, approximately 60%, \$52,900.

Budget:

Personnel	\$69,100
Travel	2,000
Other services	3,000
Supplies	5,000
Equipment	<u>9,000</u>
Total	\$88,100

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970</u> (Man-Years Amount)	<u>Base Resources to be reallocated</u> (Man-Years Amount)	<u>Additional Resources Requested for 1972</u> (Positions Amount)
			3 \$42,200

Endangered Freshwater Fishes of South America: Systematic, Ecological, and Biogeographic Research.
The inland lakes, streams and rivers of South America, which have the largest fresh water fish fauna of any continent are endangered by the increasing encroachment of civilization and accompanying environmental disturbances. Studies of the kinds and diversity of fish species, their geographic distributions, and their ecological requirements would be based on existing collections and data in the Smithsonian and other museums and on field studies. Cooperation with South American and other institutions and training programs for South American ichthyologists would be instituted to train scientists in those countries to carry on these programs in the future in cooperation with institutions in this country with local funding in each case.

The need for this project is urgent. South America is developing rapidly, and there is already much concern over decimation of many areas. The fish fauna is estimated to comprise about 5000 species, about 10 times the number in North America, but our knowledge of this fauna is still only fragmentary. It is at about the same stage as that of the North American fish fauna 100 years ago. Many species remain to be described and some may become extinct before discovery. Fish are important as food and as part of the ecological balance of aquatic ecosystems.

<u>Program Category</u>	<u>I a -</u>	<u>II -</u>
	\$31,700	\$10,500

<u>Level of Effort</u> in 1970	<u>Man-Years Amount</u>	<u>Base Resources</u> to be reallocated	<u>Man-Years Amount</u>	<u>Additional Resources</u> Requested for 1972	<u>Positions</u> <u>Amount</u>
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Project Description

As a result of the aquarium trade, some South American species have been introduced into North American waters, a few of them to the detriment of our native fauna and environment. The South American Piranna and the Old World "walking catfish" are examples of introduced species on which insufficient information was available prior to their introduction into this country. It is essential to learn more about the species in their native areas to provide data for control in the United States. Similarly, great alteration of fresh water habitats has already occurred in South America following introductions of Northern Hemisphere fishes such as carp, goldfish, and trout.

Much of the aquatic environment in South America is deficient in calcium carbonate, producing a delicate ecological balance that is highly susceptible to pollution. The potential effects of human population growth and urbanization on fresh water fishes in South America and the role of fishes in changing habitats can be assessed only when basic information on the systematics and ecology of fishes is available.

Three new positions would be required: a zoologist, GS-13; a museum technician, GS-7; and a secretary, GS-5. Illustrations and computer services required would be \$3,000. Beginning in fiscal year 1973, a field program would be initiated. The total annual cost of the entire project would be \$65,000. For the first year, the requirements of Program Category Ia would be about \$75%, \$31,700 and those of Program Category II about 25%, \$10,500.

Budget:

Personnel	\$33,700
Travel	1,500
Other services	3,000
Equipment	<u>4,000</u>
Total	<u>\$42,200</u>

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Level of Effort in 1970	Base Resources to be reallocated	Additional Resources Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions Amount</u>

Project Description

Comparative Faunistic Inventory of Indo-Pacific Coral Reef Fishes. Increased human population growth and associated industrial growth in coastal areas threaten the coral reef environment in the Indo-Pacific region. This vast area comprises about one-half of the earth's fish fauna. Most of this fauna is associated with the extensive coral reefs of the area. Reefs are being destroyed to create ship channels, and coastal docking areas are being polluted by human waste and shipping refuse. Recent population explosions of the "crown-of-thorns" starfish, in part as a result of human interference threaten vast coral reef areas. Inventories of the fishes of the coral reefs of the Indo-Pacific region are needed now while these reefs are still in a relatively undisturbed state. Knowledge of these faunas will provide valuable baseline data and enable ecologists to assess the effects of human encroachment and thus permit the development of intelligent plans to avoid widespread disastrous results of human actions.

The MNH houses one of the world's largest collections of Indo-Pacific reef fishes. Of these over 20,000 lots of specimens are unsorted and unidentified. These collections would serve as the starting point for an inventory of the fishes of the area.

The first stage of the project would be the sorting and identification of the material acquired as a result of international oceanographic programs such as the International Indian Ocean Expedition and to

<u>Program Category</u>	I a - \$2,700
II	- \$11,000

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1 \$13,700

Additional Resources Requested for 1972 Positions Amount

Base Resources to be reallocated Man-Years Amount

Level of Effort in 1970 Man-Years Amount

Project Description

prepare lists of fish species by geographic areas within the Indo-Pacific. The second stage would consist of field collecting expeditions to acquire fishes from little known areas. In fiscal year 1972 one technical aide, a GS-7 museum technician, would be required for sorting and identifying material. Computer time and laboratory and equipment supplies would also be needed. The field work which would begin in fiscal year 1973 would require two additional aides, a supervisory technician, ship time, travel, computer time, field supplies, and equipment and additional laboratory supplies. Three new positions would be needed in fiscal year 1973. The annual budget on a continuing basis would be \$90,000 per year, with the cost in fiscal year 1973 being somewhat higher due to the expense involved in the operation of the ship to make collections.

Budget for fiscal year 1972:

Personnel	\$ 8,700
Supplies	<u>5,000</u>
Total	\$13,700

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

Project Description	Level of Effort	Base Resources	Additional Resources
	in 1970	to be reallocated	Requested for 1972
	<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
	<u>Amount</u>		<u>Amount</u>
Systematic and Ecological Research on Tropical Birds and Mammals.			
Knowledge of the biology of many species of Old World tropical birds and mammals is rudimentary. Detailed studies of the ecology of birds and mammals in undisturbed tropical habitat are few. In mammals, even elementary habitat and faunistic information is lacking for many species and areas. Although basic taxonomy and general distribution of tropical birds has been well studied by an earlier generation of scientists, most of what we know about molt, breeding cycles, migration, population structure, ecological interactions, structural and physiological adaptation, and the process of speciation, is based on temperate zone species, which in general are specially adapted to rigors of seasonal change. The poorly known tropical species are far more numerous and they represent the stem groups from which many specialized temperate species evolved. Increased knowledge of tropical mammals and birds is therefore of primary scientific importance.	4		\$72,400

Project Description

Systematic and Ecological Research on Tropical Birds and Mammals.

Knowledge of the biology of many species of Old World tropical birds and mammals is rudimentary. Detailed studies of the ecology of birds and mammals in undisturbed tropical habitat are few. In mammals, even elementary habitat and faunistic information is lacking for many species and areas. Although basic taxonomy and general distribution of tropical birds has been well studied by an earlier generation of scientists, most of what we know about molt, breeding cycles, migration, population structure, ecological interactions, structural and physiological adaptation, and the process of speciation, is based on temperate zone species, which in general are specially adapted to rigors of seasonal change. The poorly known tropical species are far more numerous and they represent the stem groups from which many specialized temperate species evolved. Increased knowledge of tropical mammals and birds is therefore of primary scientific importance.

<u>Program Category</u>	I a -	\$29,000
	I b -	\$29,000
	II -	\$14,400

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Level of Effort in 1970
Man-Years Amount

Base Resources to be reallocated
Man-Years Amount

Additional Resources Requested for 1972
Positions Amount

Project Description

One approach to problems of evolution and environmental adaptation is through biological comparison of the three major tropical regions of the world. Considerable work on the birds and mammals of the New World tropics is in progress in NMNH, STRI, and other research centers, but increased effort is needed in tropical Africa and Asia to provide a basis for comparison. In addition, the systematic relationships among tropical families of the world must be better known to support sound conclusions in evolutionary, ecological, and zoogeographical studies. The two scientists requested under this program would engage in basic research along these lines.

The rate of destruction of natural habitats in Africa and tropical Asia through economic development and the use of pesticides and herbicides is such that the opportunity to make biological studies will be gone forever within one or two decades in many areas.

Less than ten years ago, NMNH had four world-known research specialists in Old World tropical birds and mammals;

Project Description	Level of Effort in 1970		Base Resources to be reallocated		Additional Resources Requested for 1972	
	Man-Years	Amount	Man-Years	Amount	Positions	Amount

today we have only one. This program is intended not only to restore our research competence and leadership but also to provide identification and other information services relevant to biomedical, ecological, and conservation programs sponsored by other government agencies.

The collections of Old World tropical birds and mammals in NMNH are outstanding both in older material collected over 80 years ago and in recently collected specimens. The collections continue to grow through systematic, ecological, and public health studies sponsored by such agencies as AID, Department of Defense, SEATO, the World Bank, the International Biological Program, and natural history museums in Asia and Africa. These collections should be maintained so that the specimens and related data are readily accessible to scientists working in various fields of research in this country and throughout the world.

Current needs for research, service, and curation related to the Old World tropics could be met by two new professional positions (2 zoologist, GS-13, on a specialist in Asian and African birds the other in Southeast mammals) and two new support positions (2 museum technicians, GS-7).

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<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

Project Description

Illustrations would require \$2,000, and computer time \$3,000. Program Categories Ia and Ib would account for approximately 40% each of the total budget, or \$29,000 and \$29,000, respectively; Program Category II would account for approximately 20% or \$14,400.

Budget:

Personnel	\$ 53,400
Travel	2,000
Other services	5,000
Supplies	2,000
Equipment	<u>10,000</u>
Total	<u>\$72,400</u>



Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

\$5,000

Project Description

Systematic Research on Freshwater Amphibians and Reptiles. The rapid disappearance of unpolluted freshwater streams has increased the value of the museum's extensive older collections of freshwater frogs, salamanders, turtles and crocodilians. The collections provide an irreplaceable source of baseline environmental data, such as: distribution and relative densities of locally extirpated species; their former food habits including samples of microfaunas and floras which may likewise have been extirpated; and changes in pollutant levels in body tissues through time. It is of urgent importance both to improve the accessibility of data in these older collections through systematic studies and to add new current baseline material to the collections while the animals remain in relatively clean waters. Large collections of North and South American amphibians and reptiles must be studied, identified and curated before environmental data can be made available to scientists in governmental and private research institutions who require it in support of their studies of the environment. In addition, new collections coming into the museum as a result of current large scale ecological and faunal surveys must be processed promptly to develop the data needed.

This project would require \$1,000 in bottles, \$1,000 in tanks, and \$3,000 in computer time. Program Category Ia would account for approximately 50%, \$2,500 of the total budget; Program Category Ib 25% or \$1,200, and Program Category II 25% or \$1,300.

<u>Program Category</u>	I a - \$2,500
	I b - \$1,200
	II - \$1,300
	0
	0
	0

Budget:

Other services	\$3,000
Supplies	1,000
Equipment	1,000
Total	<u>\$5,000</u>

NATIONAL MUSEUM OF NATURAL HISTORY

Increases for 1972 by Project

<u>Project Description</u>	<u>Level of Effort in 1970 Man-Years Amount</u>	<u>Base Resources to be reallocated Man-Years Amount</u>	<u>Additional Resources Requested for 1972 Positions Amount</u>
			2 \$38,700

Systematic Research on Sharks and Rays. Information on the systematics and biology of sharks and rays is of importance to investigators in many fields. These fishes are used as experimental animals by physiologists, behaviorists and biochemists. Shark attacks are a continuing problem in terms of military operations and recreational activities. Some scavenger species are important in recycling solid wastes from cities which are dumped into the sea, while other species serve as food. The NMNH houses the largest collection of sharks and rays in the world. Because of their large size, few museums can keep shark specimens and they must generally be studied where they are because of problems of shipment. The species are difficult to distinguish and combined museum and field study is necessary to clarify systematic and ecological problems. For several years systematic studies of sharks have been conducted in NMNH supported by the Office of Naval Research and Bureau of Commercial Fisheries, but this support will cease by June 1971. However, scientists in government agencies, universities and private research institutions will continue to look to the National Museum of Natural History for information on the systematics and habits of sharks. It is an obligation of the National Museum to perform this valuable service to the scientific community--and to the public whose concern mounts as recreational activities increase. The curation of the extensive collections of these large fish must be maintained in order to meet these needs.

<u>Program Category</u>	I a - \$ 7,700
	I b - \$19,400
	II - \$11,600

<u>Level of Effort in 1970</u>	<u>Base Resources to be reallocated</u>	<u>Additional Resources Requested for 1972</u>
<u>Man-Years</u>	<u>Amount</u>	<u>Positions</u>
<u>Amount</u>	<u>Amount</u>	<u>Amount</u>

Project Description

This project would require two new positions: a zoologist, GS-13, and a museum technician, GS-7. Illustrations for publications would require \$1,500, tanks \$4,000, and computer time \$2,000. Program Category Ia would account for approximately 20% of the total budget, or \$7,700; Program Category Ib for approximately 50%, or \$19,400; Program Category II for approximately 30%, or \$11,600.

Budget:	
Personnel	\$26,700
Travel	1,000
Other services	3,500
Supplies	1,000
Equipment	<u>6,500</u>
Total	\$38,700



Increases for 1971 by Project

<u>Level of Effort</u> in 1969	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1971
<u>Man-Years</u> <u>Amount</u>	<u>Man-Years</u> <u>Amount</u>	<u>Positions</u> <u>Amount</u>

Basic Research on the Functional Anatomy of Birds, Reptiles and Amphibians.

\$2,000

A. The osteological collection of fossil and recent birds in the National Museum of Natural History is the largest in the world. The collection is a unique resource for basic anatomical and evolutionary studies, which is consulted by systematists, anatomists, archiologists, and game law enforcement officers in the museum, other governmental bureaus such as the Department of the Interior, and universities both in this country and abroad. Each specimen demands considerable cleaning and preparation before it is ready for study. Through support from private funds, considerable progress has been made in reducing the backlog of unprepared osteological specimens. Such private funds were not available beginning in Fiscal Year 1970. The present backlog of unprepared specimens is 5,000 with 1,000 new specimens being received yearly. A program has been developed based on the processing of 1,500 specimens per year over a 10-year period. At the end of this 10-year period the data on the collection could be currently maintained and made available to serious students and scientists generally and would expand this valuable service in support of research by a broad spectrum of the scientific community.

B. At present about one half the osteological collections of reptiles and amphibians has not been properly curated. The skeletons are lying

<u>Program Category</u>	<u>IB</u>	<u>-\$1,000</u>
0	II	-\$1,000
0		
0		

Level of Effort in 1969 Man-Years Amount
 Base Resources to be reallocated Man-Years Amount
 Additional Resources Requested for 1971 Positions Amount

loose in open containers. There is urgent need to put these collections in closed skeleton boxes so that they can be used efficiently and effectively by the SI research staff and other scientists who wish to consult these collections in connection with their own studies of functional anatomy and systematics.

Program Category Ib would account for 50% or \$1,000 of the total budget; Program Category II for the other \$1,000.

Budget:

Supplies	\$1,000
Equipment	<u>1,000</u>
Total	\$2,000

0
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III General Public Enlightenment

<u>Item</u>	<u>Position</u>	<u>Amount</u>	<u>Page No.</u>
(1) Development of Informational Materials for use by the General Public	<u>3.0</u>	<u>21.9</u>	167

Increases for 1972 by Project

<u>Level of Effort</u> in 1970	<u>Base Resources</u> to be reallocated	<u>Additional Resources</u> Requested for 1972
<u>Man-Years Amount</u>	<u>Man-Years Amount</u>	<u>Positions</u> Amount

		3
		\$21,900

Project Description

Development of Informational Materials for Use by the General Public. Heightened public interest in the nature and quality of the environment has greatly increased the demand for information on invertebrate organisms and their environment. Much of this information is available as a result of research programs of the Department of Invertebrate Zoology, but research reports are generally too technical in nature for public use. This program would provide information on invertebrates and their natural history in ways that could be understood and used by the American public, hobbyists, collectors and particularly students at all levels. One technician would be required to prepare up to date, scientifically accurate, easily understood informational materials on mollusks and another to prepare such material on other invertebrates in general.

This project required 3 new positions: 2 museum technicians, GS-5, and 1 clerk-typist, GS-4.

Budget:

Personnel	\$20,300
Other services	600
Supplies	800
Equipment	200
Total	<u>\$21,900</u>

Program Category III

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